TRAP

TRUSS RATING AND ANALYSIS PROGRAM

Bridge Engineering Software & Technology (BEST) Center
Department of Civil and Environmental Engineering
University of Maryland
College Park, MD

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TRAP USER MANUAL

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Abstract

The computer program TRAP (Truss Rating and Analysis Program) performs an analysis or rating group loading of a simply supported or continuous span truss having up to six spans, in accordance with AASHTO specifications, 17th Edition with up to 2003 interims, and AASHTO LRFD Design Specifications (Sixth Edition with up to 2013 interims). Also, the program, since version 4.00, is capable of performing the analysis and rating of a prestressed truss. Live load, using State of Maryland or AASHTO, is performed automatically. In addition, a general truck configuration having up to forty (40) axles may be input for a special posting rating analysis.

The program uses the direct stiffness method to generate influence lines for truss member forces, cable forces, reactions and panel point deflections. These influence lines then are used to determine the maximum compressive and tensile forces in each member under the indicated live loading. Capabilities include the automatic computation of Inventory, Operating, and Posting Ratings per AASHTO recommendations.

Output contains a verification of truss geometry and loading input, and includes member, cable and panel point data, truss heights, and geometric data for all members. Also included in the output are panel point dead loads, deflections, reactions, and a force summary due to DL + LL + I for all members. Finally, a summary of the truss rating analysis output is given. Output of a group loading analysis and the governing case can be obtained by inputting the appropriate program option.

A new feature added allows rating using either Load Factor (LFD) or Load and Resistance Factor (LRFD) methods which are based on the following criteria:

1. Load and Resistance Factor Design (LRFD) Rating based on the AASHTO "Manual for Bridge Evaluation," 2nd Edition with up to 2014 Interims;

2. National Bridge Inventory (NBI) Rating based on the AASHTO "Manual for Condition Evaluation of Bridges," 1994 and updated Interims (2^{nd} edition);

3. Load Factor (LFD) Rating based on the AASHTO "Guide Specifications for Strength Design of Truss Bridges (Load Factor Design)," 1986 and updated Interims.

4. New Load and Resistance Factor Design (LRFD) based on the AASHTO LRFD Bridge Design Specifications, 6^{th} Edition with 2013 Interim Revisions.

[Note: The WINDOWS upgrade for the V6.00 Series version is called WIN V.1.00. In Version 6.00, both English and SI units are allowed.]

TRAP

1.0 USING WIN-TRAP

WIN-TRAP currently is available for use on microcomputers using the Microsoft Windows environment. This manual describes the Windows version of **WIN-TRAP**, hereafter referred to as **TRAP**. This version utilizes a Windows-based pull-down menu structure to access **TRAP's** input, execution, graphic, and printing utilities.

1.1 Before You Begin

TRAP is designed to run on microcomputers that use the Microsoft Windows operating system. While this manual provides step-by-step instruction in the use of **TRAP**, it cannot address the specific operation of every personal computer (PC). Before you begin, please ask yourself the following questions:

1. Are you familiar with Microsoft Windows?
2. Do you have an understanding of the concepts and use of terms such as menus, help screens, cursor, mouse, files, etc.?
3. Have you read/installed the **TRAP** software using the installation instructions you received?
4. Have you filed your installation instructions with your other **TRAP** reference material?

If you cannot answer "Yes" to all of these questions, please take the time to address them before continuing on in this manual.

If you are prepared to continue, take a moment to look over the Table of Contents provided at the beginning of this manual. You will find that the remainder of this document illustrates the detailed use of the four basic utility functions of **TRAP** in Section 1.4.

The remainder of this section describes how to enter **TRAP** and how to access the Main Menu.

1.2 Accessing the Main Menu

The **TRAP** MAIN MENU is the main access screen to each of the utilities provided within the **TRAP** system. It is also the main return point when you have finished using one of the utilities.

If you have not yet done so, please refer to your installation instructions and install your **TRAP** software.

If your PC is currently off, simply turn it on and run Microsoft Windows. After entering Windows, **TRAP** can be run by double-clicking the **TRAP** icon. The **TRAP**

Introduction Screen will be displayed on your monitor in a few seconds.

1.3 The TRAP Main Menu

This screen allows you to access any of the five utilities in **TRAP** or to exit the program. These are the Input, Run, Graphic, Print, and Help utilities.

Input Utility – allows you to create new bridge data files or to edit existing files. Once you have entered the details of a structure, then you can save it for later use.

Run Utility – allows you to execute the **TRAP** program using the data stored in any of your input data files.

Graphic Utility – allows you to view and print graphic files.

Print Utility – allows you to view and print output files and tables. It also provides a directory of available tables for your convenience.

Exit – allows you to exit **TRAP** simply by clicking on the word '**Exit**' in the **TRAP** Main Menu or by typing **Alt-x** on your keyboard.

Help Utility – allows you to view help for the Help basics, commands, and buttons. Help Utility also may be accessed from Input Utility.

1.4 Detailed Usage of the Utility Programs

Input Utility is accessed by clicking on the Input in the main menu. It allows you to create new bridge data files or to edit existing files. Once you have entered the details of a structure, you can then save it for later use.

To open a data file:

1. On the **File** menu, click **Open**.
2. In the **Look** in box, click the drive that contains the file.
3. Below the look in box, click the folder that you want.
4. Double-click the data file, or type it in the **File Name** box.

To create a new data file:

On the **File** menu, click **New**.

To save a new, unnamed data file

1. On the **File** menu, click **Save As.**
2. In the **File** name box, type a name for the data file.
3. Click **Save**.

To save an existing data file:
On the **File** menu, click **Save**.

Input Screens

The available input categories are Structure, Live Load, Dead Load, and Geometry. Each category has its own submenu(s) which include related bridge input data screens.

Using the keyboard with input screens:

To move in a table	Press
To the next cell in the row	ENTER or TAB or Right arrow
To the previous cell in the row	Left arrow
Up one row in a table	Up arrow
Down one row in a table	Down arrow
To move in individual fields	Press space bar
To the next field	ENTER or TAB or Right arrow or Down arrow
To the previous field	Left arrow or Up arrow

To delete, cut, copy, and paste data in a field

To delete data, select them. Then on the Edit menu, click **Delete**.
To cut data so you can move it to another field, select the data. Then on the Edit menu, click **Cut**.
To copy data so you can paste a copy of it in another field, select the data. Then on the Edit menu, click **Copy**.
To paste data you have cut or copied, click the place where you want to put the data. Then on the Edit menu, click **Paste**.
To undo your last action, on the Edit menu, click **Undo**.

To delete, cut, copy and paste data in a row:

To delete a row of data, double click the gray area on the leftmost side of the table to highlight the row. Then on the Edit menu, click **Delete**.
To cut a row of data so you can move it to another place, double click the gray area on the leftmost side of the table to highlight the row. Then on the Edit menu, click **Cut**.
To copy a row of data so you can paste it in another place, double click the gray area on the leftmost side of the table to highlight the row. Then on the Edit menu, click **Copy**.

To paste a row of data you have cut or copied, double click the gray area on the leftmost side of the table to highlight the row where you want to put the data, Then on the Edit menu, click **Paste**.
To undo your last action, on the Edit menu, click **Undo**.

Going to the next or previous screen:

Clicking on the <back> icon takes you back to the previous screen.

Clicking on the <down> icon takes you down to the next screen.

Going to a specific screen:

On the Input Screen menu click any input screen title.

On the Go To menu click any input screen data type number.

Run Utility is accessed by clicking on the **Run** in the main menu. It allows you to execute the **TRAP** program using the data stored in any of your input data files.

To select an input data file:

1. Click the **Input File** button.
2. In the **Look** in box, click the drive that contains the file.
3. Below the look in box, click the folder that you want.
4. Double-click the data file, or type it in the **File Name** box.

NOTE:
The default output file will appear below the output file button, after an input data file is selected.
To select a different output file, click the **Output File** button, then follow the same procedures.

To execute TRAP:

Clicking the **OK** button on the run utility screen will execute **TRAP.** After the execution starts, a separate window will appear on the screen with the program status shown.

Print Utility

To change printers and printing options:

1. On the **Print** menu, click **Print Setup**.

2. To change printers, paper size, or page orientation, make the appropriate modifications.
3. Click **OK**.

Print screen

On the **Print** menu, click **Print Screen**.

Print Utility is accessed by clicking on **Print** in the main menu.
It allows you to view and print output files and tables. It also provides a directory of available tables for your convenience.

To open a result file:

1. Click the drive that contains the file.
2. Click the directory folder that you want.
3. Double-click the file in the file list box or type it in the file name box.
4. Click **OK**.

To view the whole result file:

Click the **View/Print File** tab to view the whole file.

To find a string:

1. Click **Find String**.
2. In the **Enter Search String** box, enter the text you want to search for.
3. Click **OK**.

To find next string:

Click **Find Next** to search the next string.

To print the whole result file:

1. Click the **Print button**.
2. Chose a printout option.
3. Click **OK**.

To change printing options:

1. Click **Print Setup**.
2. To change printers, paper size, or page orientation, make the appropriate modifications.
3. Click **OK**.

To view the tables:

1. Click the **View Tables** tab.
2. Click on a table you would like to view from the list on the top.
3. The selected table will be displayed on the bottom.

To print the tables:

1. Click the **Print Tables** tab.
2. Click on the tables you would like to print from the list on the bottom.
3. The selected tables will appear on the top list.
4. Click **Print**.

Note: To delete a table from the top list, click on the table.

Graphic Plot:

By clicking on the word '**Graphic**,' shown in the menu bar of the Main Menu screen, you will be transferred to the **TRAP** Graphic Utility screen. The geometry of the truss will be shown on the screen. The user may toggle joint and member numbers, zoom or unzoom the graphics. The graphic picture also can be printed out by clicking on the **Print** option.

2.0 DESCRIPTION

2.1 GENERAL

This chapter describes the application capabilities of the TRAP program. A summary of these features along with the limitations is given in Table 2.1, Summary of Program Features and Limitations. A more detailed description of the program and the equations used are given in Chapter 5.0, Methodology.

2.2 STRUCTURAL MODEL

The bridge structure is modeled as a two-dimensional truss with loads applied in the plane of the truss. The deformations, member forces and reactions are solved utilizing the stiffness method in matrix format, which allows great flexibility in the type of structure which can be accommodated. The specific structural features which can be accommodated and several assumptions are described as follows:

1) Bridges which are either statically determinate or indeterminate.

2) Bridges which are either deck or through trusses or a combination of both.

3) Members may have flanged or box sections.

4) The material is assumed to obey Hooke's Law and the structural displacements are assumed small.

5) All joints are assumed pinned.

6) Dummy members are assumed to have no axial stiffness.

7) The deck may be attached to vertical members (see Chapter 5.0, Methodology).

8) The truss can be prestressed with different cables and the program is capable of analyzing the prestressed truss.

9) Cables can be in tension only.

2.3 DEAD LOADING

All loadings due to dead load (DL) are computed and applied automatically by the program from basic input information. The approximations and assumptions used are described as follows:

1) The dead load for the steel of the truss structure is computed from the sections input times a detail factor (to account for the structural details such as

bolts, gusset plates, etc.).

2) Uniform loads are used to define the floor steel, slab and wearing surface, railing and curb, and utilities and accessories. These are given in intensity per linear length and may be composed of up to nine segments of different intensities.

3) Dead loads which are given as concentrated panel point loads are used to describe wood bracing DL or any miscellaneous loads which may occur. These may be placed on any or all of the points of the truss.

2.4 LIVE LOADING

TRAP automatically determines the maximum compressive and tensile forces for all truss members and cables, if any, maximum downward and upward reactions and maximum deflections at each lower panel point. They are obtained by applying the AASHTO lane and specified H or HS truck loadings, the interstate vehicle, AASHTO LRFD HL-93 loading, AREA Cooper E40 to E80, and any truck configuration specified by the user. These are all activated together or separately at the option of the user. Some special features regarding the application of live loadings are as follows:

1) The distribution factor may be input, or else it is automatically generated by the program.

2) The LL can be applied at the top chord panel points, at the bottom chord panel points, or intermediate in a vertical member.

3) The impact factors are obtained considering loaded lengths (such as required by AASHTO for continuous beam bridges--see Methodology, Section 5.3 (4)).

2.5 LOAD COMBINATIONS

The combinations of loads employed by TRAP utilize the working stress criteria, load factor criteria and load and resistance factor criteria, and incorporate the AASHTO specifications to define different combinations of loads.

There are seven groups representing various combinations of loads which are considered in TRAP. In addition to dead load and live load, some other loadings regarding the application of combinations of loads are as follows:

1) Thermal forces: The member forces due to thermal effect are computed automatically by the program from the input temperature change of each member. The effect is considered in the specific groups.

2) Wind loads on truss: For all truss members, TRAP automatically determines the member force due to wind loads on the truss using the default intensity 75 lb/sf or user input intensity for different wind conditions.

3) Wind on live load: TRAP can determine the member forces due to wind on live load using the default intensity 100 lb/sf.

4) Longitudinal forces: The effect of longitudinal forces is the partial effect of the live load; TRAP determines this automatically.

2.6 RATING

The rating analysis employed by TRAP utilizes the working stress criteria, load factor criteria and load and resistance factor criteria, and incorporates the AASHTO specification to limit the stress to a maximum permissible level to which a structural member may be subjected. Only axially loaded members are considered in the analysis. The allowable axial stress (or capacity) is determined by the program and is dependent upon whether the structural member is in tension or compression.

Six possible ratings can be performed by the TRAP system. The capability exists whereby the allowable stress level for a particular rating function can be input to override the system default value. These six rating types, and the allowable stress which is used automatically for each, are given as follows:

1) Inventory Rating: Live loading consists of the AASHTO truck (H, HS, or Interstate) or lane loading. Unless otherwise specified, the allowable stress is 0.55 F_y. For cable the allowable stress is 0.6 F_y. (For LFR or LRFR, allowable stress is replaced by the capacity.)

2) Operating Rating: Live loading consists of AASHTO truck (H, HS, or Interstate) or lane loading. Unless otherwise specified, the allowable stress is 0.75 F_y. For cable the allowable stress is 0.9 F_y. (For LFR or LRFR, allowable stress is replaced by the capacity.)

3) Posting 1: Live loading consists of the State Truck #1, as designated on input data type 0301. The allowable stress is normally input; however, if left blank, the program assumes 0.75 F_y. For cable the allowable stress is 0.9 F_y. (For LFR or LRFR, allowable stress is replaced by the capacity.)

4) Posting 2: Live loading consists of the State Truck #2, as designated on input data type 0301. The allowable stress is normally input, however, if left blank, the program assumes 0.75 F_y. For cable the allowable stress is 0.9 F_y. (For LFR or LRFR, allowable stress is replaced by the capacity.)

5) Posting 3: Live loading consists of the State Truck #3, as designated on data type 0301. The allowable stress is normally input, however, if left blank, the program assumes 0.75 F_y. For cable the allowable stress is 0.9 F_y. (For LFR or LRFR, allowable stress is replaced by the capacity.)

6) Special Truck Posting: Live loading consists of the special truck, as

designated on input data type 0302 and 0303. The allowable stress can be specified on data type 0302, or the system will assume a value of 0.75 F_y for truss members and 0.9 F_y for cable. (For LFR or LRFR, allowable stress is replaced by the capacity.)

The TRAP system uses program-generated influence lines as the means for calculating member forces. Application of the live load, with impact, results in the actual maximum live load stress for each structural member.

The Rating Factor (see Section 5.5, Rating) is computed for each structural member as follows:

$$\text{Rating Factor} = \frac{\text{Allowable Stress} - \text{DL Stress}}{\text{Actual (LL + I) Stress}}$$

$$\text{Rating Factor} = \frac{\text{Capacity} - \text{DL Force}}{\text{(LL + I) Force}}$$

A rating factor less than one indicates that the structural member does not adequately sustain the given live load.

2.7 PRESTRESSING

The truss can be prestressed using three different cable layouts. The TRAP program can analyze this type of prestressed truss. In the case of draped cable, the cable changes its direction through the rotation over a pulley placed on the truss joint. A more detailed description of the methodology and the equation used in the analysis and rating are given in Chapter 6, Methodology of Prestressed Cables.

TABLE 2.1 SUMMARY OF PROGRAM FEATURES AND LIMITATIONS

NO.	ITEM AND DESCRIPTION	
1.0	**LIMITATIONS**	**Limit**
1.1	Maximum number of spans	6
1.2	Maximum number of joints	400
1.3	Maximum number of members and cables	450
1.4	Maximum number of detail factors	1
1.5	Maximum number of joints at any panel point	4
1.6	Maximum number of uniform DL segments	9
1.7	Maximum number of supports	7
1.8	Maximum number of panels	100
1.9	Maximum number of straight cables	10
1.10	Maximum number of one-drape cables	10
1.11	Maximum number of two-drape cables	10
1.12	Members are assumed to act in both tension and compression. Cables are assumed to act in tension only.	
1.13	Overhangs are not allowed.	
2.0	**FEATURES**	
2.1	Conforms to the 2003 AASHTO Standard Specifications and AASHTO LRFD Specifications 6th Edition with 2013 Interim.	
2.2	Automated DL for all construction conditions including ties.	
2.3	Automated LL for AASHTO, Interstate, AREA and special trucks.	
2.4	All impact factors are automatically calculated either on the basis of the actual span length or loaded lengths (where appropriate).	
2.5	Bridge may be determinate or indeterminate and of any configuration (e.g., deck truss, through truss, etc.).	
2.6	Maximum positive and negative effects are given for ll members and cables, reactions and deformations.	
2.7	User specified truck loadings..	
2.8	User can specify different levels of output.	
2.9	Influence line option.	
2.10	Combination of loads.	
2.11	Complete analysis of prestressed cable truss system.	

3.0 INPUT

All numerical input must have a decimal point except those designated as integer or alphanumeric, which must be right-justified. All data types, except project description cards, require a header card with only the data type number given and the remaining fields blank. By using the Windows version, field justification and header cards will be taken care of by the program.

3.1 SYSTEM DATA

Data Type 0101: Project Description

Alphanumeric. Input a general description of the project program that is to be printed on the first page of the output only. This may consist of up to two input lines.

Data Type 0102: Project Description

Alphanumeric. Input a single-line description of the project or problem that is to be printed on every page of output.

Data Type 0103: Program Options

OUTPUT LEVEL: Integer. This value allows the selection of various analysis/rating tables to be output. Input 1 if primary (basic) output is desired. Use 2 if additional detail beyond that given by the basic output level is required. Input 3 and influence values for reactions are given with level 2. Member force influence line values are given with additional input as described in Section 3.6, Member Data.

SYSTEM OPTION: Integer. This input data indicates that the truss is to be analyzed, rated and that only input verification will be given or group loading is required. Input 1, 2, 3, or 4 as described in Table 3.1, Definition of System Options.

MODULUS OF ELASTICITY (KSI or MPa): Real. Input the modulus of elasticity. If left blank, the system will use the modulus of elasticity for steel (29,000 ksi).

WIND INTENSITY (KSF or MPa): Real. Input the wind intensity to be used in the analysis for group loading. If left blank, the system will use a value of 0.075 ksf.

PRESTRESS OPTION; NO(0), YES(1): Integer. If a prestressed truss needs to be analyzed or rated, input one (1).

Data Type 0104: General Truss Configuration

SPAN LENGTHS, SPAN 1 - SPAN 6 (FT or m): Decimal. Input the length of each span in feet. (Overhangs are not allowed.) Leave blank the input field for any spans not used.
CURB DISTANCE (FT or m) or AXLE DISTRIBUTION FACTOR: Input the width between curbs (the clear roadway width) or the LL axle distribution factor. If the width between curbs is entered, the LL axle

distribution factor will be automatically calculated according to AASHTO specifications.

DISTANCE BETWEEN TRUSSES (FT or m): Enter the distance in feet between the center line of each vertical truss.

DEAD LOAD DETAIL FACTOR: Input the dead load detail factor to account for bolts, weldments, etc. This factor will be used to increase the weight of all truss members. If left blank, the system will use one (1).

Data Type 0105: Design Method and Load/Resistance Factors

DESIGN METHOD: Integer. Working Stress Design (0), Load Factor Design (1), Guide Load and Resistance Factor Design (2), or AASHTO Load and Resistance Factor Design (3).

DEAD LOAD FACTOR: Decimal. Default is 1.0 for WSD, 1.3 for LFD, and 1.25 for LRFD.

PRESTRESS LOAD FACTOR: Decimal. Default is 1.0.

LIVE LOAD FACTOR FOR AASHTO TRUCK: Decimal. Default is 1.0 for WSD and 1.3 x 5/3 for LFD and 1.75 for LRFD.

LIVE LOAD FACTOR FOR STATE VEHICLE: Decimal. Default is 1.0 for WSD and 1.3 x 5/3 for LFD, and 1.75 for LRFD.

LIVE LOAD FACTOR FOR OVERLOAD: Decimal. Special Vehicle is considered an overload. Default is 1.0 for WSD and 1.3 x 5/3 for LFD, and 1.35 for LRFD.

IMPACT FACTOR: Decimal. Default is AASHTO impact factor. If specified, it will be constant throughout.

RESISTANCE FACTOR for TENSION, Φ_R : Decimal. Default is 1.0.

a. For LFD (1) or LRFD Guide (2), the Resistance Factor Φ_R is applied to tension allowable as a reduction factor (≤ 1.0) where P_r follows the LRFD calculation.
b. For LRFD (3), the Resistance Factor $\Phi_R = \Phi_c\Phi_s\Phi$ where Φ_c = condition factor, Φ_s = system factor and Φ = LRFD resistance factor. Φ_R is applied to tension to represent a reduction factor to account for shear lag. The lesser of $P_r=\Phi_y F_y A_g = 0.95\Phi_R F_y A_g$ and $P_r=\Phi_u F_u A_e = 0.8\Phi_R F_u(A_n U)$ will be used as the tensile resistance.
   AASHTO LRFD Art. 6.8.2.2:
   U=1 for welded connection;
   U=0.90 for flange bolted rolled I- and tee-shapes with flange widths not less than 2/3 the depth and n
   less than 3 fasteners per line;
   U=0.85 for other bolted members with no less than 3 fasteners per line;
   U=0.70 for all bolted members with 2 fasteners per line.

RESISTANCE FACTOR for COMPRESSION, Φ_R: Decimal. Default is 1.0.

a. For LFD (1), the total Resistance Factor is $\Phi_T = 0.85\Phi_R$.

b. For LRFD Guide (2), the total Resistance Factor is $\Phi_T = \Phi_R$.
c. For LRFD (3), the total Resistance Factor is $\Phi_T = 0.9\Phi_R$. $\Phi_R = \Phi_c\Phi_s\Phi$ where Φ_c = condition factor, Φ_s = system factor and Φ = LRFD resistance factor.

DUCTILITY, REDUNDANCY and IMPORTANCE FACTOR *($\eta_i = \eta_D\eta_R\eta_I$, LRFD only)*: *$\eta_1$ and η_2 are defined below.*

a. For Strength Limit State use only (η_1): Decimal. Default is 1.0
b. For other limit states (η_2): Decimal. Default is 1.0

3.2 Live Load and Rating Data

Data Type 0301: General Live Load and Rating Data

AASHTO LIVE LOAD, INVENTORY/OPERATING LOAD NAME: Alphanumeric. Input the standard AASHTO L, H or HS Truck Designation, or HL-93 LRFD design vehicular live load (See Table 3.2 for standard truck designations).

If SYSTEM OPTION = 1 for Analysis Only (see Table 3.1), then this vehicle will be the only live load considered in the truss analysis. All other columns of this data type should then be left blank.

If SYSTEM OPTION = 2 for Rating Only (see Table 3.1), then this vehicle will be the live load used to compute the bridge Inventory Rating. Other rating vehicles may be input as described below.

WSD ONLY: AASHTO LL INVENTORY ALLOWABLE STRESS FACTOR FOR TRUSS MEMBER: Decimal. Input the allowable stress factor to be used in the bridge Inventory Rating. If left blank, the system will use the standard AASHTO factor of 0.55.

WSD ONLY: AASHTO LL INVENTORY ALLOWABLE STRESS FACTOR FOR CABLE: Decimal. Input the allowable stress factor to be used in the bridge Inventory Rating. If left blank, the system will use the standard AASHTO factor of 0.6.

WSD ONLY: AASHTO LL, OPERATING ALLOWABLE STRESS FACTOR FOR TRUSS MEMBER: Decimal. Input the allowable stress factor to be used in the bridge Operating Rating. If left blank, the system will use the standard AASHTO factor of 0.75.

WSD ONLY: AASHTO LL, OPERATING ALLOWABLE STRESS FACTOR FOR CABLE: Decimal. Input the allowable stress factor to be used in the bridge Operating Rating. If left blank, the system will use the standard AASHTO factor of 0.9.

INTERSTATE; NO (0), YES (1): Integer. If interstate (tandem) loading is to be considered for either analysis or rating, input one (1).

STATE VEHICLE POSTING, VEHICLE ONE/TWO/THREE DESIGNATION: Alphanumeric. Input the code of the state vehicle for which a Posting Rating is required. Up to three (3) state vehicles may be considered for a Posting Rating. If less than three state vehicles are to be considered, they should be

specified beginning with vehicle one designation. Allowable state vehicle designations are given in Table 3.2, Allowable Live Load Types. If the vehicle is not one of those predefined in Table 3.2, data types 0304, 0305, and 0306 should be input for state vehicles 1, 2, and 3, respectively.

WSD ONLY: STATE VEHICLE POSTING, ALLOWABLE STRESS FACTOR FOR TRUSS MEMBER: Decimal. Input the allowable stress factor to be used in the Posting Rating of the specified state vehicles. If left blank, the system will use the standard AASHTO factor of 0.75.

WSD ONLY: STATE VEHICLE POSTING, ALLOWABLE STRESS FACTOR FOR CABLE: Decimal. Input the allowable stress factor to be used in the Posting Rating of the specified state vehicles. If left blank, the system will use the standard AASHTO factor of 0.9.

3.3 SPECIAL VEHICLE DATA

Data Type 0302: 1st Special Truck Identification and Posting Information

SPECIAL VEHICLE LOADING DESIGNATION: Alphanumeric. Input any code to identify the special truck.

SPECIAL VEHICLE DESCRIPTION: Alphanumeric. Input any description of the vehicle to be given in the program output.

WSD ONLY: SPECIAL VEHICLE ALLOWABLE STRESS FACTOR FOR TRUSS MEMBER: Decimal. Input the allowable stress factor to be used in the Posting Rating of the special vehicle. If left blank, the system will use the standard AASHTO factor of 0.75.

WSD ONLY: SPECIAL VEHICLE ALLOWABLE STRESS FACTOR FOR CABLE: Decimal. Input the allowable stress factor to be used in the Posting Rating of the special vehicle. If left blank, the system will use the standard AASHTO factor of 0.9.

SPECIAL VEHICLE COMBINATION OPTION: Integer. If 1 is specified, AASHTO truck with its distribution factor (as defined in Data Type 0104 or calculated by the program) will combine with Overload (Special vehicle) with the distribution factor that is defined below.

SPECIAL VEHICLE DISTRIBUTION FACTOR: Decimal. If a combination of AASHTO and Overload trucks is considered, this distribution factor will be applied to the Overload. Therefore, it is recommended to compute the distribution factor with only the near lane loaded. The program then assumes the near lane is occupied by Overload and the other lanes are loaded by AASHTO trucks with multilane reduction considered.

Data Type 0303: Special Vehicle Axle Weights and Spacings

AXLE NO: Integer. Input the sequence number of the axle beginning with one (1).

AXLE WEIGHT (KIPS or KN): Decimal. Input the weight of the axle.

SPACING NO: Integer. Input the number of the nth spacing between the nth and nth+1 axles.

SPACING DISTANCE (FT or m): Decimal. Input the nth distance between the nth and nth+1 axles.

3.4 STATE VEHICLE DATA

Data Type 0304: State Vehicle One: Axle Weights and Spacings

AXLE NO: Integer. Input the sequence number of the axle beginning with one (1).

AXLE WEIGHT (KIPS or KN): Decimal. Input the weight of the axle.

SPACING NO: Integer. Input the number of the nth spacing between the nth and nth+1 axles.

SPACING DISTANCE (FT or m): Decimal. Input the nth distance between the nth and nth+1 axles.

Data Type 0305 and 0306: See 0304 for State vehicles two and three.

Data Type 0307 and 0308: See 0302 and 0303 for Special Vehicle (Overload) two.

3.5 PANEL POINT DATA

Data Type 0401: Panel Point Data

PANEL POINT NO: Integer. The number of each panel point and subdivision in the planar truss starting with the one at the extreme left bridge support.

LOWER, UPPER, A and B PANEL POINTS, X and Y COORDINATES (FT or m): Decimal. Input the X and Y coordinates of all panel points.

NOTE: The coordinate system should be positioned such that all panel points are positive and lie in the first X-Y quadrant (see Figure 3.1). In addition to the upper and lower panel points, the capability exists within TRAP to define two extra panel points A and B (see Figure 3.1).

RESTRAINTS, X and Y: Integer. The definition of the support restraints at the panel point locations in the X and Y directions. Use 1 if the panel point is restrained in the X or Y direction. For example, if the support is pinned, use 1 for both directions; if roller, use 1 for Y direction and 0 for X direction.

NOTE: Care should be taken when specifying support restraints. Every structure must be restrained

from moment in the X and Y direction and, therefore, must contain at least 1 pinned point and 1 roller point.

NOTE: In order to identify whether the first upper or lower panel point exists, while inputting for the Data Type 0401--Panel Point Data--the user should be careful about the first panel point for different cases which are described as follows:

(1) For a through truss without first upper panel point, the X and Y coordinates of the lower panel point should be specified with right justification within the entry block while the other coordinate entries should be left blank, e.g.:

DATA NO.	PANEL POINT	LOWER PANEL PT. X	LOWER PANEL PT. Y	UPPER PANEL PT. X	UPPER PANEL PT. Y
0401	1	0.00	0.00		

(2) For a deck truss without first lower panel point, the X and Y coordinates of the upper panel point should be specified with right justification within the entry block while the other coordinate entries should be left blank, e.g.:

DATA NO.	PANEL POINT	LOWER PANEL PT. X	LOWER PANEL PT. Y	UPPER PANEL PT. X	UPPER PANEL PT. Y
0401	1			0.00	20.00

(3) For a through or deck truss with first panel vertical member, both upper and lower panel point coordinates should be filled with right justification within the entry block, e.g.:

DATA NO.	PANEL POINT	LOWER PANEL PT. X	LOWER PANEL PT. Y	UPPER PANEL PT. X	UPPER PANEL PT. Y
0401	1	0.00	0.00	0.00	20.00

Other panel points' coordinates can be input within the appropriate entry blocks.

3.6 MEMBER DATA

Data Type 0501: Member Data

Truss member data must be entered left to right in the following order:

(1) All lower chords;

(2) All upper chords;

(3) All additional chords A and B (if any);

(4) All vertical members;

(5) All diagonal members.

MEMBER NO: Integer. The member sequence number starting with 1 and ending with the total number of members.

MEMBER LOCATION AND DESIGNATION: Alphanumeric. The designation of each member with respect to the panel points. Examples include: L4U5, A1U2, L5U5, etc. (There are four fields--1 alpha of 1 character, 1 numeric of 3 characters, 1 alpha of 1 character, and 1 numeric of 3 characters. The numeric fields should be right-justified if less than three digits. L = Lower; U = Upper; Additional Codes: A = A, B = B, etc.)

RELEASED MEMBER: Integer. Use 1 if the member is free from resisting axial forces (such as in dummy members).

LOADED MEMBER SEQUENCE NO: Integer. The sequence of loaded vertical members starting from the left (see Figure 3.2).

NOTE: A loaded member must always be specified at the first and last panel points of a truss bridge. This would be the vertical end post for a truss having end verticals. For a truss without end verticals, the horizontal or near horizontal member framing into each end panel point is specified as the first and last loaded member, respectively. A diagonal member is never given a loaded member sequence number.

LOADED MEMBER DECK LOCATION (FT or m): Decimal. The distance from the top of the loaded vertical member to the point where the deck is connected (see Figure 3.4).

MINIMUM RADIUS OF GYRATION (IN or mm): Decimal. The value of the minimum radius of gyration of the member.

MEMBER DEPTH (IN or mm): Decimal. The depth of the member measured along an axis parallel to the connecting plates (see Figure 3.3).

MEMBER AREA, GROSS (SQ IN or mm^2 H 100): Decimal. The gross area of the member.

MEMBER AREA, NET (SQ IN or mm^2 H 100): Decimal. The net area of the member.

YIELD STRESS (KSI or MPa): Decimal. The yield stress of the material used, as given by the AASHTO specifications.

INFLUENCE LINE OPTION: Integer. An option which will allow the user to select which member influence line will be output.

(1) Input 0 (or leave blank) if no influence line output is desired.

(2) Input 1 if a table of influence line values for the given member is to be output.

EFFECTIVE LENGTH FACTOR: Decimal. The effective length factor of the member. If left blank, 1 is assumed.

TEMPERATURE CHANGE: Decimal. The temperature change of the member. If left blank, 0 is assumed.

NOTE: (1) For a through or deck truss with first and last vertical members, the first and last loaded members should be the first and last vertical members correspondingly while their deck locations can be specified accordingly.
(2) For a through truss without first and last vertical members, the first and last loaded members should be the fist and last lower chords correspondingly while their deck locations should be specified as zero or left blank. The other vertical members should be loaded sequentially from sequence no. 2.
(3) For a deck truss without first and last vertical members, the first and last loaded members should be the first and last upper chords correspondingly while their deck locations should be specified as zero or left blank. The other vertical members should be loaded sequentially from sequence no. 2.

3.7 CABLE DATA (FIG. 3.5)

If the prestressing option in Data Type 0103 is set equal to1, at least one of the following cable data cards should be input. If the prestressing option is 0, no cable data type should be input.

Data Type 0502: Straight Cable Data (Fig. 3.5a)

CABLE NO: Integer. The straight cable sequence number starting with 1 and ending with the total number of straight cables.

CABLE LOCATION AND DESIGNATION: Alphanumeric. The designation of each cable with respect to the panel points. (Fig. 3.6a) Examples include: L4U5, A1U2, L5U5, etc. (There are four fields--2 alphas of 1 space each and 2 numerics of 3 spaces each. The numeric fields should be right-justified if less than three digits.)

CABLE AREA, NET (SQ IN or mm^2): Decimal. The net area of the straight cable.

YIELD STRESS (KSI or MPa): Decimal. The yield stress of the material used, as given by the AASHTO specifications.

PRESTRESS FORCE (KIPS or KN): Decimal. Input the prestress force used in prestressing the cable.

INFLUENCE LINE OPTION: Integer. An option which will allow the user to select which member influence line will be output.

(1) Input 0 (or leave blank) if no influence line output is desired.

(2) Input 1 if a table of influence line values for the given member is to be output.

Data Type 0503: One-Drape Cable Data (Fig. 3.5b)

CABLE NO: Integer. The one-drape cable sequence number starting with 1 and ending with the total number of one-drape cables.

CABLE LOCATION AND DESIGNATION: Alphanumeric. The designation of each cable with respect to the panel points (Fig. 3.6b). Examples include: L4U5L6, A1U2L5, L5U5L6, etc. (There are six fields--3 alphas of 1 space each and 3 numerics of 3 spaces each. The numeric fields should be right-justified if less than three digits.)

CABLE AREA, NET (SQ IN or mm^2): Decimal. The net area of the cable.

YIELD STRESS (KSI or MPa): Decimal. The yield stress of the material used, as given by the AASHTO specifications.

PRESTRESS FORCE (KIPS or KN): Decimal. Input the prestress force used in prestressing the cable.

INFLUENCE LINE OPTION: Integer. An option which will allow the user to select which member influence line will be output.

(1) Input 0 (or leave blank) if no influence line output is desired.

(2) Input 1 if a table of influence line values for the given member is to be output.

Data Type 0504: Two-Drape Cable Data (Fig. 3.5c)

CABLE NO: Integer. The two-drape cable sequence number starting with 1 and ending with the total number of two-drape cables.

CABLE LOCATION AND DESIGNATION: Alphanumeric. The designation of each member with respect to the panel points. (Fig. 3.6c) Examples include: L4U5U6L7, A1U2U3L4, etc. (There are eight fields--4 alphas of 1 space each and 4 numerics of 3 spaces each. The numeric fields should be right-justified if less than three digits.)

CABLE AREA, NET (SQ IN or mm^2): Decimal. The net area of the cable.

YIELD STRESS (KSI or MPa): Decimal. The yield stress of the material used, as given by the AASHTO specifications.

PRESTRESS FORCE (KIPS or KN): Decimal. Input the prestress force used in prestressing the cable.

INFLUENCE LINE OPTION: Integer. An option which will allow the user to select which member influence line will be output.

Input 0 (or leave blank) if no influence line output is desired.

(2)Input 1 if a table of influence line values for the given member is to be output.

3.8 UNIFORM DEAD LOADS (FIG. 3.7)

Data Type 0601: Dead Load Data

Uniform Dead Loads for the truss deck can be given as:

(1) Uniform loads due to floor steel,

(2) Uniform loads due to slab and wearing surface,

(3) Uniform loads due to railing and curb, and

(4) Uniform loads due to utility and accessories.

These are input as follows:

Data Types 0601, 0602, 0603, 0604: Uniform Dead Loads

LOAD NO: Integer. Input sequence load segment, beginning with one (1). These are precoded on the input sheets.

LOAD (KLF or KN/m): Decimal. Input the intensity of the load in kips per linear foot of the truss.

DISTANCE FROM LEFT END BRIDGE, FROM, TO (FT or m): Decimal. The location of the left and right ends of the uniform loaded segment measured from the left end of the bridge.

3.9 PANEL POINT BRACING DEAD LOADS (FIG. 3.8)

Dead loads due to lateral bracing can be input as concentrated panel point loads for (1) lower panel points, (2) upper panel points, (3) panel points A, and (4) panel points B. These are given as follows:

Data Types 0701, 0702, 0801, 0802: Bracing Panel Point Loads

PANEL POINT NUMBER: Integer. This is the sequence number of the panel point beginning with one (1). The sequence number for upper, lower, and additional panel points are as given on input card type 0401.

One panel point can refer to, at most, a lower, upper, additional A, and additional B panel points.

LOAD (KIPS or KN): Decimal. Input the value of the vertical concentrated load.

3.10 MISCELLANEOUS PANEL POINT LOADS (Fig. 3.8)

Dead loads due to any miscellaneous source can be input as concentrated panel point loads for (1) lower panel points, (2) upper panel points, (3) panel points A, and (4) panel points B. These are given as follows:

Data Types 0901, 0902, 1001, 1002: Miscellaneous Panel Point Loads

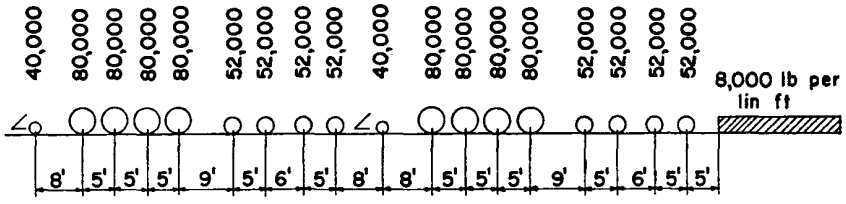
PANEL POINT NUMBER: Integer. This is the sequence number of the panel point beginning with one (1). The sequence number for upper, lower, and additional panel points are as given on input data type 0401. One panel point can refer to, at most, a lower, upper, additional A, and additional B panel points.

LOAD (KIPS or KN): Decimal. Input the value of the vertical concentrated load.

Table 3.1 - Definition of System Options (Data Type 0103)	
SYSTEM OPTION	**DESCRIPTION**
1	Analysis Only: This option indicates that the AASHTO Live Load specified on data type 0301 under "Inventory Rating" will be applied automatically and the structure analyzed according to the standard working stress method. No other live load analyses can be made during the same run, and no rating information will be given.
2	Rating Only: This option indicates that at least one rating analysis will be performed. Rating types, vehicles, and allowable stresses are given on data types 0301, 0302, and 0303. All vehicles given will be applied automatically and the structure rated accordingly for each one.
3	Input Verification Only: This option allows the scan of all input data for possible errors. This affords the user a visual check of the truss structure definition.
4	Combinations of Loads Only: This option performs the combinations of loads according to the AASHTO definitions shown in Table 5.1. The results of every group loading and the critical group for all member forces will be shown in this option. Prestressing option should be 0 in this option; i.e., no group loading for prestressed truss.

Table 3.2 — Allowable Live Load Types		
DESCRIPTION	**INPUT LOADING DESIGNATION**	**CONFIGURATION**
AASHTO LIVE LOADING (DATA TYPE 0301)	H-10, H-15, H-20 HS-15, HS-20 or HL-93	As given by the 2003 AASHTO Standard Specification for Highway Bridges and ASHTO LRFD Bridge Specifications, 6th Edition with 2013 Interim.
STATE VEHICULAR LOADING (DATA TYPE 0301)	Any 9-Character Alphanumeric	As requested by user, cards (0304, 0305, 0306). The catalogue of six (6) predefined state vehicles are given in Table 3.3.
SPECIAL VEHICLE LOADING (DATA TYPES 0302 AND 0303)	Any 9-Character Alphanumeric	Up to 40 axles.

Table 3.3 — Default State Vehicle											
VEHICLE DESCRIPTION											
Name	Axle	1	2	3	4	5	6	7	8	9	10
2D	Weight (K)	32	8								
	Spacing (FT)	12									
3D	Weight (K)	28	28	9							
	Spacing (FT)	4	12								
MST76	Weight (K)	9.28	20	20	12	12					
	Spacing (FT)	16	4	22	4						
TYPE-3	Weight (K)	16	17	17							
	Spacing (FT)	15	4								
TYPE-3S2	Weight (K)	10	15.5	15.5	15.5	15.5					
	Spacing (FT)	11	4	22	4						
TYPE-3-3	Weight (K)	12	12	12	16	14	14				
	Spacing (FT)	15	4	15	16	4					
OL1	Weight (K)	10	21.5	21.5	21.5	21.5					
	Spacing (FT)	10	4	12	4						
OL2	Weight (K)	12	21.5	21.5	22	21.5	21.5	22	21.5	21.5	22
	Spacing (FT)	10	4	6	16	4	6	14	4	6	
P82	Weight (K)	15.74	26.98	26.98	26.98	26.98	26.98	26.98	26.98		
	Spacing (FT)	11	4	4	24	4	4	4			



Cooper E80

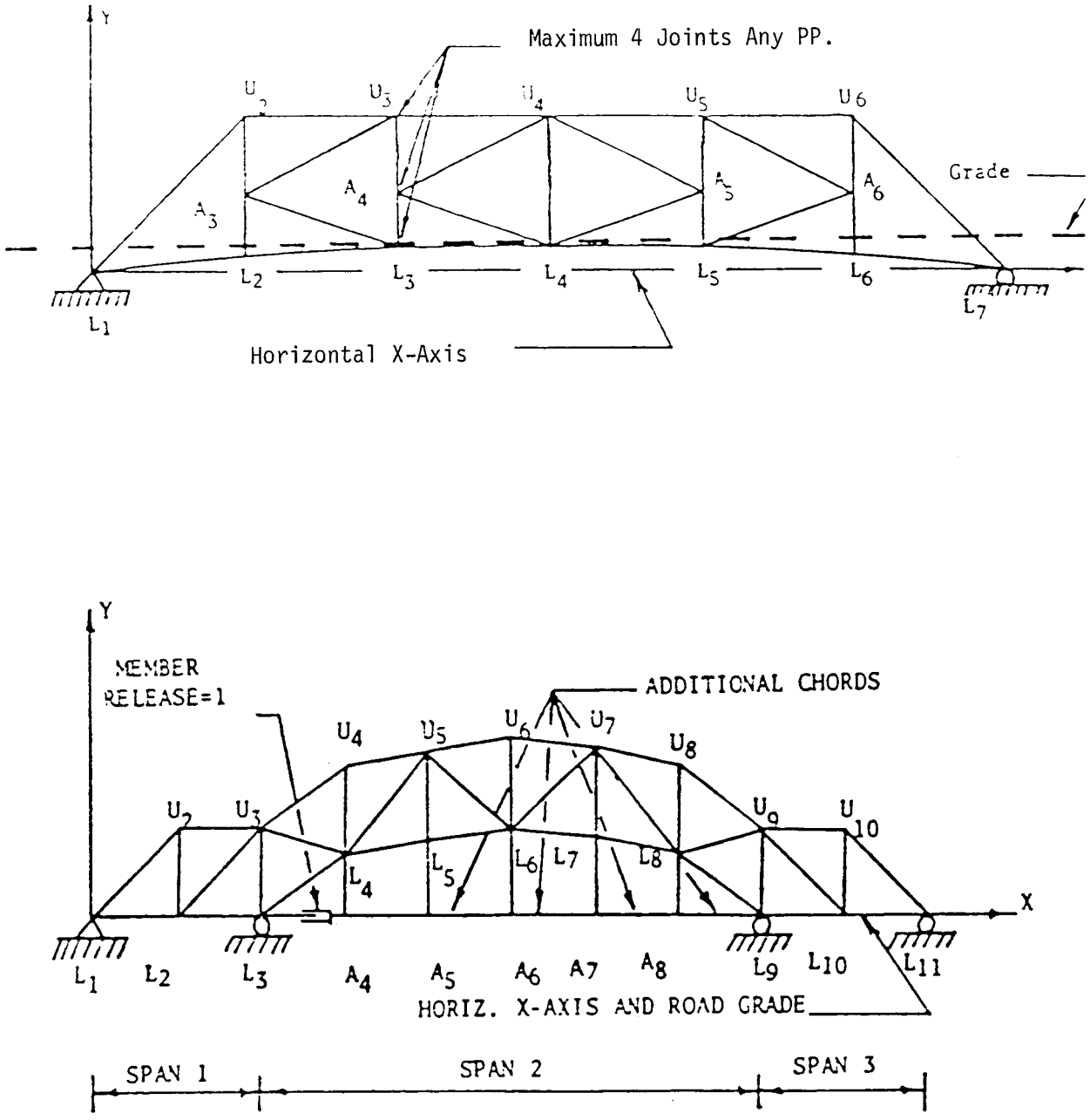


FIG. 3.1 – HIGHWAY BRIDGE TRUSS NOMENCLATURE

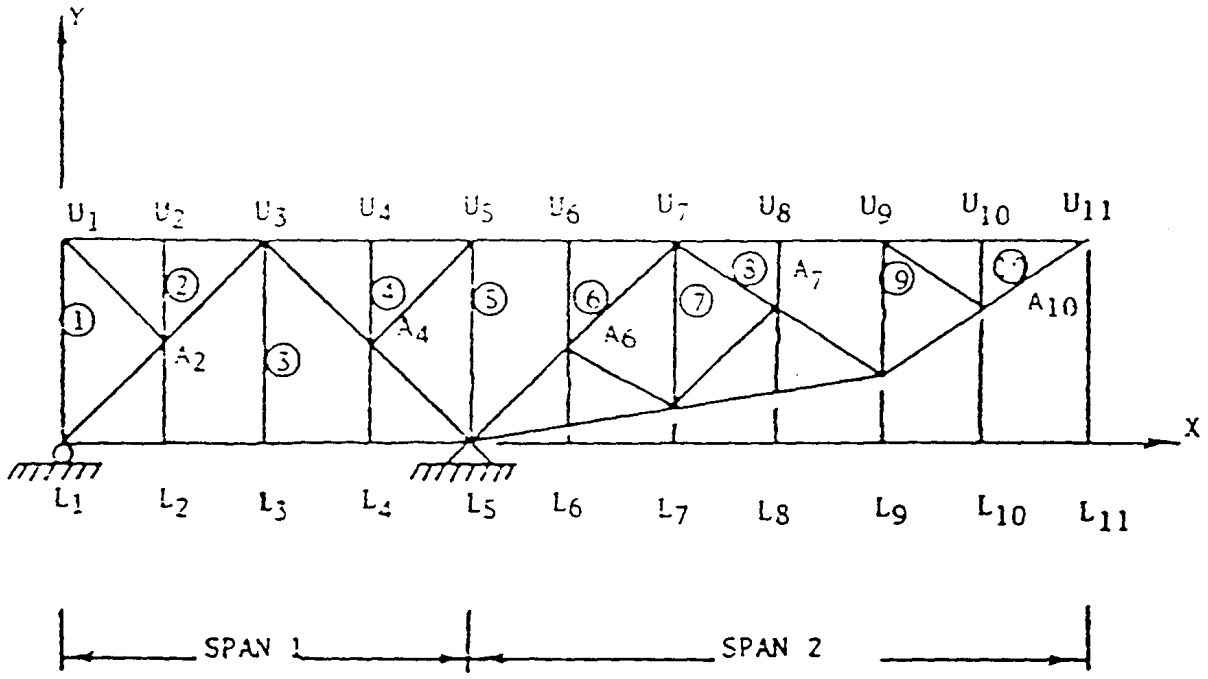
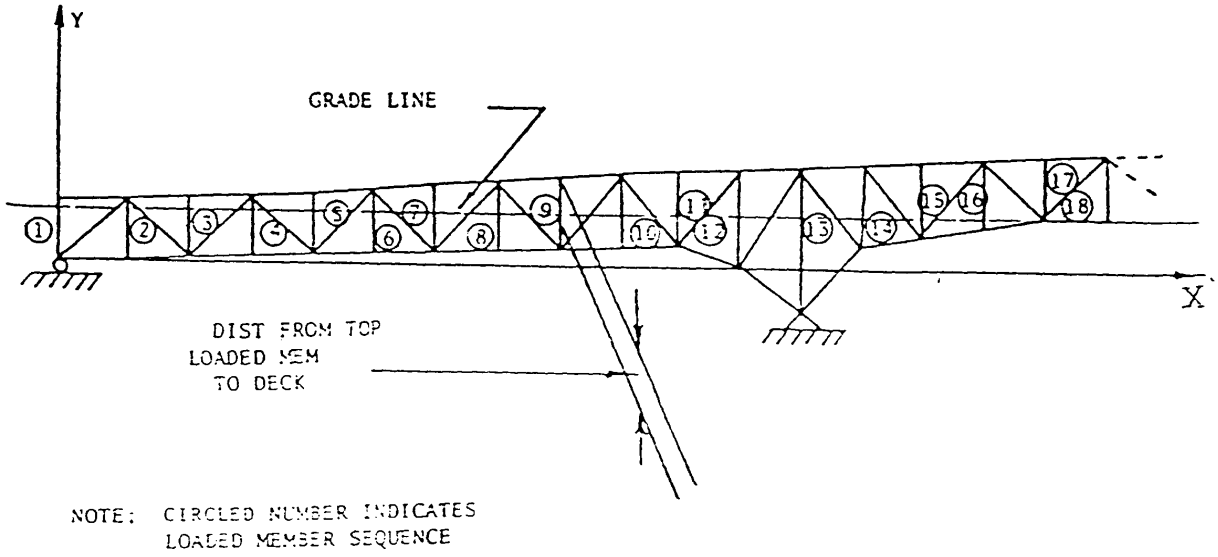


FIG. 3.2 – LOADED VERTICALS



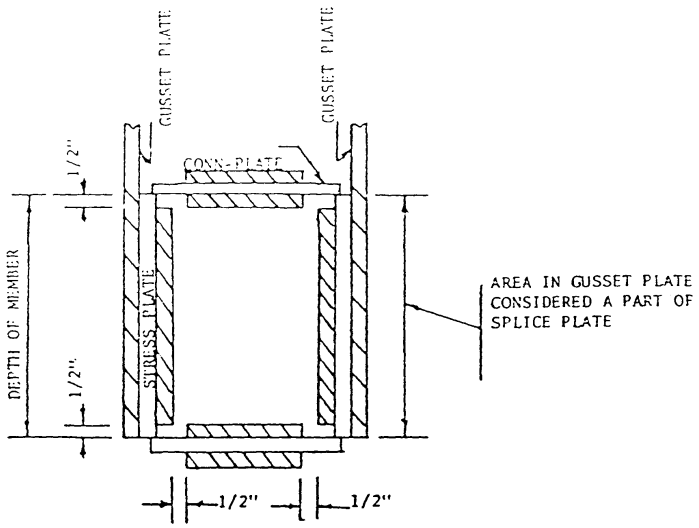


FIG. 3.3 – MEMBER COMPONENTS

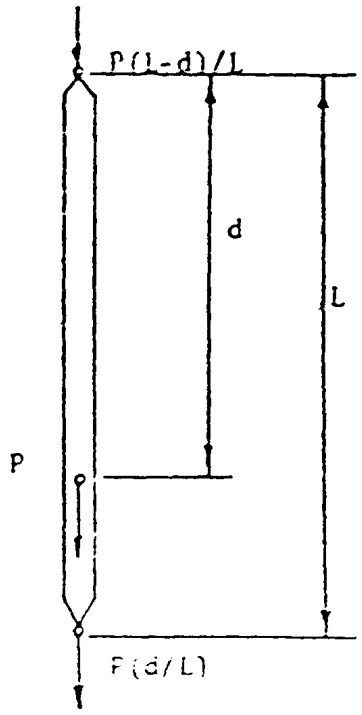


FIG. 3.4 – DECK LOAD DISTRIBUTION

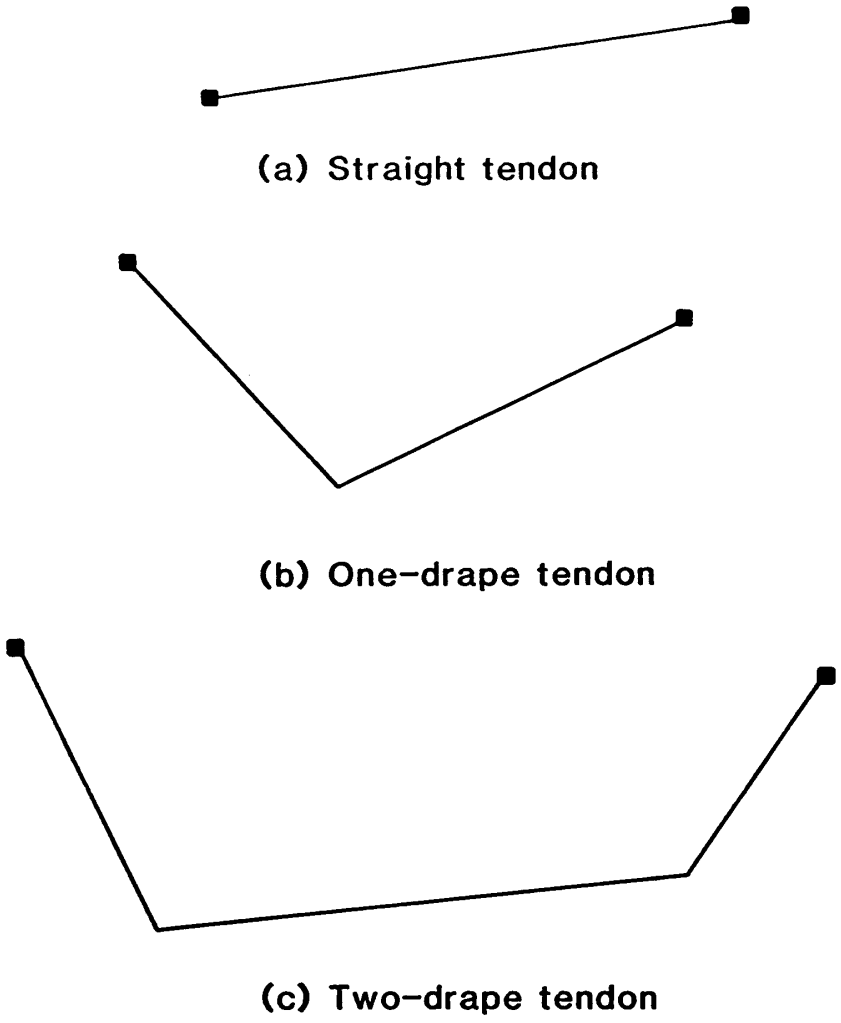
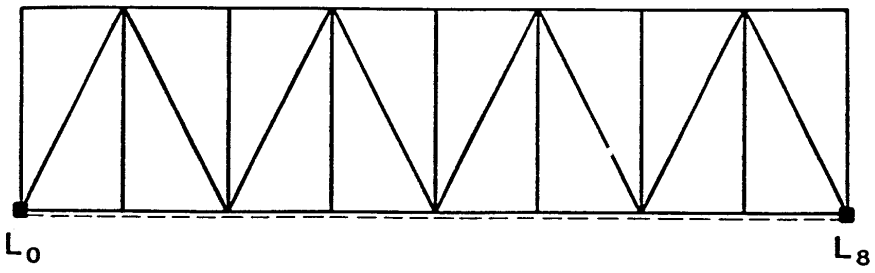
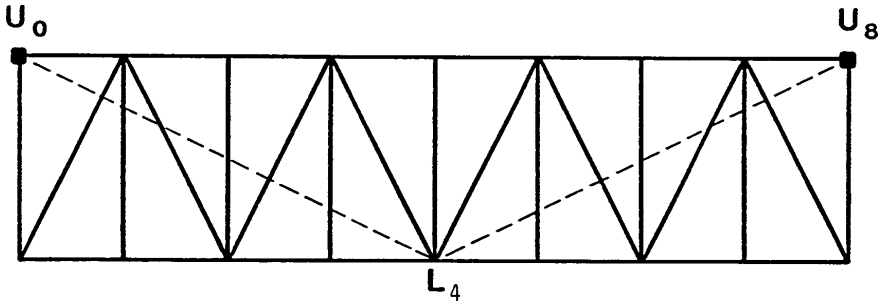


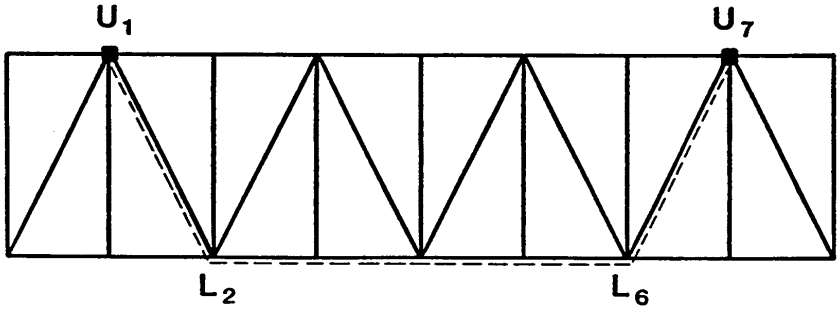
FIG. 3.5 – PRESTRESSING CABLE TYPEES



(a) Configuration of Truss {1} with Straight Cable



(b) Configuration of Truss {1} with One-Drape Cable



(c) Configuration of Truss {1} with Two-Drape Cable

FIG. 3.6 – CONFIGURATION OF TRUSS EXAMPLES WITH VARIOUS TYPES OF CABLE

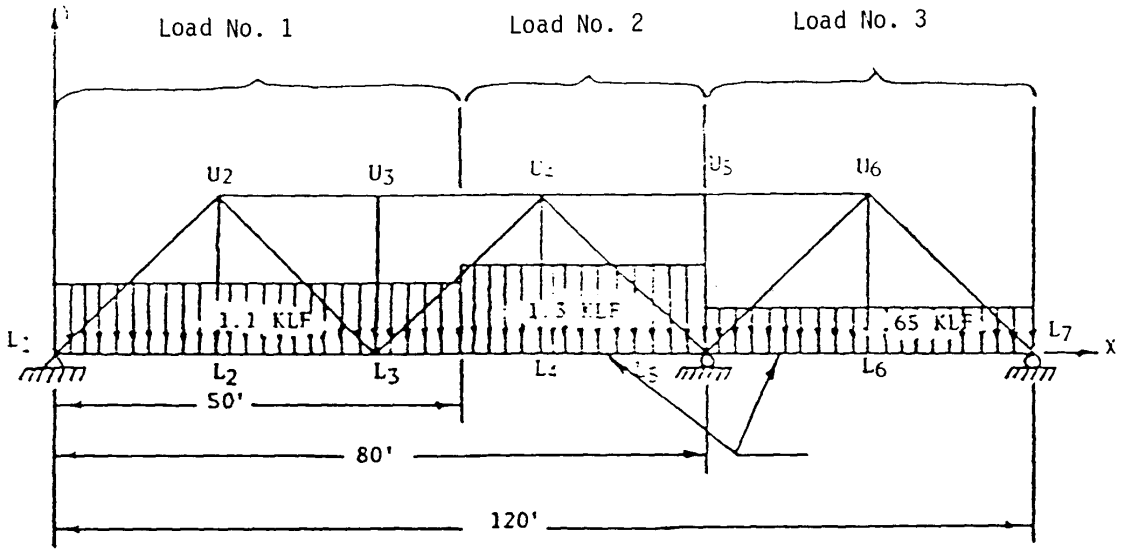


FIG. 3.7 – SEGMENTED UNIFORM LOADS

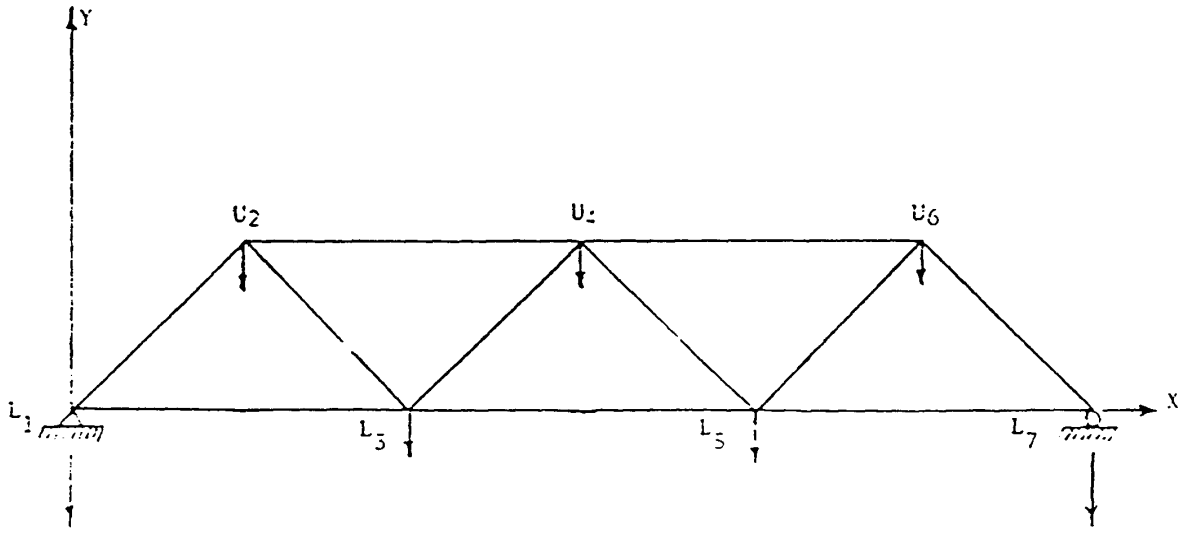


FIG 3.8 – PANEL POINT LOADS

4.0 OUTPUT

4.1 GENERAL

Various engineering and diagnostic levels of output are available. These depend upon the output level specified and whether an analysis, rating of the truss (prestressed or not) or combinations of loads is being performed. All output is given in the form of tables identified by number and title. Appendix A, Index of Output Tables gives a listing of all program output tables and indicates under what OUTPUT LEVEL (DATA TYPE 0103) and for which function (Analysis, Rating, or Combinations of Loads) each table is given.

4.2 RATING AND ANALYSIS OUTPUT

The various tables available for truss analysis, rating and load combinations are described in Appendix B, Definition of Output Tables. Given for each output table is the actual output heading along with a definition of each item that appears in that heading.

4.3 OPTIONAL PROGRAM OUTPUT

Optional program output consists of tables of influence line values of the truss for member forces and prestressed cables.

Output of TRAP Table 4.3, Reaction Influence Line Values, requires that OUTPUT LEVEL = 3 on Data Type 0103. Additionally, output of any member force influence line values is obtained by setting INFLUENCE LINE OPTION = 1 on data types 0501, 0502, 0503, and 0504 for prestressed cables. This will cause output of TRAP Table 4.1, Member Influence Line Values, and TRAP Table 4.1A, Cable Influence Line Values for Prestressed Cables.

5.0 METHODOLOGY

This program has the capability of performing an analysis and rating of a truss bridge (which can be prestressed with several cable layouts) of a general geometry and member configuration. The following are the assumptions upon which the program is based.

5.1 STRUCTURAL ANALYSIS OF TRUSS

The stiffness method (see any text on matrix structural analysis) is applied herein to the analysis of a plane truss. The form of the method adopted assumes that the structure is linearly elastic(*), all connections are pinned and all loads are considered to be acting at the panel points. Basic output tables from the method are member axial forces, reactions, and joint deflections.

* For a structure to be linearly elastic, it is assumed that the material must obey Hooke's Law, and that displacement must be small in comparison with overall dimensions.

5.2 DEAD LOAD

In order to yield maximum program flexibility, the dead load is categorized into three types: (1) uniform loads along the deck, (2) concentrated panel point loads, and (3) the weight of the truss.

Dead loads which are uniform along the deck are used to describe the floor steel, slab and wearing surface, railing and curb, and utilities and accessories. These are given in units of kips per linear foot and may be composed of up to 9 segments of differing intensities. In determining the effect of deck loads, the deck, either supported directly at a panel point or attached to a vertical member, is assumed to act as a simple beam between support points. If the deck is attached to any vertical member, it is assumed that the load from the deck reaction is distributed to the upper and lower support points of the vertical member in the proportion shown in Figure 3.4

Dead loads which are given as concentrated panel point loads are used to describe wind bracing dead loads or any miscellaneous loads which may occur. These may be placed on any or all of the joints throughout the truss, downward taken as positive.

Dead loads due to the weight of the truss are obtained by accumulating the simple beam reactions due to member weights at each panel point throughout the truss. The member weights

are computed by taking the product of the member lengths, the gross member areas and the density of steel (taken as kcf) times a constant detail factor.

5.3 LIVE LOAD

The live load capability of this program includes automatic determination of the maximum compressive and tensile forces for all truss members, as well as prestressed cables, if any, maximum upward and downward reactions and the maximum deflection at each lower panel point. These are determined by applying AASHTO lane, specified H or HS truck, or HL-93 LRFD design vehicle, and generalized truck loadings, to the appropriate member, reaction or deflection influence line. The specific assumptions and methodology are as follows:

(1) Distribution Factor

The distribution factor may either be input directly, or it may be generated automatically by the program. If the latter case is desired, the width between curbs or the width between trusses must be input. Here, the number of traffic lanes is determined in accordance with AASHTO. The width of a design traffic lane is computed from the width between curbs divided by the number of traffic lanes. It is assumed that the lane loadings or standard trucks can occupy any position within their individual design traffic lane in computing the maximum distribution factor.

(2) Loads

Standard AASHTO highway loadings including truck, lane and tandem are used in the program. Also included are specific state trucks (incorporated into the system, as desired, by the user) and any generalized truck.

(3) Application of Loads

The calculation of live load effects requires three phases of program operation.

The first phase involves the generation of influence lines for each member and reaction, as well as for prestressed cables, if any. If the deck is attached to any vertical member, it is assumed that the unit load is shared by the upper and lower joints, as shown in Figure 5.1. After the application of unit loads, the resulting ordinates are then stored.

The second phase of load application involves the extraction of basic data from the influence lines. These include maximum and minimum ordinates, positive and negative areas and loaded lengths of all influence lines.

The third and final phase involves the application of live loads to obtain maximum member forces and reactions, as well as cable forces, if any. This is accomplished as follows:

(a) With respect to application of AASHTO live loading, two concentrated loads are used for moment computations. These are used to obtain maximum upper chord tension and lower chord compression. However, only one concentrated load for moment is used throughout for all other truss members, except for diagonals where the concentrated load for shear is used.

In order to obtain maximum reactive forces, one concentrated AASHTO shear load is used. For maximum lower panel point deflections, one concentrated AASHTO load for moment is used.

(b) With respect to truck loading, the maximum member forces, as well as maximum cable forces, reactions and lower panel point deflections are obtained by placing and repositioning the specified trucks over the maximum ordinates of the influence lines. In the WSD/LFD analysis case where an HS loading is specified, H trucks also are tested automatically.

(4) Impact Factors

For LRFD, Impact factor is a constant. For WSD or LFD, impact factors are calculated by using the formula

$$I = \frac{50}{L + 125}$$

in which I is the impact fraction (maximum .30, minimum .10) and L is a length

given as follows:

(a) For a member force, L is taken as the loaded length of the influence line. If 2 spans contribute to the maximum member force, the L is taken as the average of 2 loaded lengths. However, in order for the second loaded length to be considered in the determination of L, it must have an area of 60% or more of the maximum area over the primary loaded length. If it does not contribute in at least this amount, it is discounted as being a loaded length.

(b) For end support reactions and lower panel point deflections, L is taken as the span length. For intermediate support points, L is taken as the average of the adjacent span lengths.

5.4 LOAD COMBINATIONS

The load combination capability of this program includes automatic determination of seven different groups and the critical group for each member. The specific assumptions and methodology are as follows:

(1) Definitions of the Specific Groups

There are 7 groups considered in this program. Group loading combinations for working stress criteria are given in Table 5.1. The percentage of the basic unit stress for the various groups is also given in Table 5.1.

(2) Approaches for the Wind Load

In the TRAP system, only the plane truss analysis is used. Under real circumstances, the direction of wind load is perpendicular to the whole plane truss. The following are the approaches and assumptions made when the wind loads are converted into the plane forces.

(A) Wind Load on Truss (W)

a. Calculate the wind load on each member.
Force = Area * Intensity
Area of each member=(member length)*(member depth)

Intensity = 75 lb/sf (3591 Pa) or input value.

b. The force (from step a.) can be taken by two joints of each member equally.

c. Repeat steps a. and b. to calculate the wind force for all members.

d. After step c., all wind forces are exerted on the joint.

e. If the total force of all joints (from steps a. to d.) is less than 450 lb/ft (6.57 KN/m), use 450 lb/ft (6.57 KN/m) instead by adjusting proportionally (Article 3.15.1 of AASHTO 2002).

f. If the support is on the lower panel point, take the moment about the lower panel point. The moment produces a vertical downward force at that panel point on the windward plane truss. The vertical force acts on the lower panel point. On the other hand, if the support is on the upper panel point, take the moment about the upper panel point, and the vertical force acts on the upper panel point.

The vertical force = the moment/truss width.

(B) Wind Load on Live Load

a. Use 100 lb per linear foot (1.46 KN/m) and distribute it to the panel joints. They are applied over the entire truss.

b. The force (from step a.) is 6 feet (1.83 m) above deck.
Find moment by force * 6 feet (1.83 m). This moment produces the vertical force on the windward plane truss.
The vertical force = moment/truss width.

c. Like step f. of part (A), it can be decided whether the vertical forces exert on the lower or upper panel points.

5.5 RATING

The TRAP system has the capability to determine the structural rating for any general truss bridge. The truss can also be prestressed, including indeterminate truss bridge structures of up to six spans. For rating truss bridge with "counter" members, ignore the rating factors for compression of counter members.

The rating procedures used by the program follow the standard AASHTO specifications for Highway Bridge Structures.

Working stress analysis procedures are used in computing the induced axial stresses of all truss members. (LFD and LRFD use the WSD analysis results, with factors multiplied.)

The AASHTO Manual for Condition Evaluation of Bridges serves as the guide for rating bridges. Three rating types are defined.

(1) INVENTORY RATING determines the bridge capacity under normal use and at the stress level for which the structure was originally designed. (Usually this allowable stress is 0.55 F_y.)

(2) OPERATING RATING determines the maximum permissible truck load allowed for a given truss bridge configuration based on an allowable stress level higher than the allowable design stress. (Usually this allowable stress is 0.75 F_y.)

(3) SAFE LOAD CAPACITY RATING (POSTING) determines whether any specific vehicle may pass safely over the bridge. Such vehicles are normally heavier than those vehicles for which an Operating Rating is computed. Special permits are issued to these trucks if the axle load distribution is such that the stresses produced do not exceed the allowable stress level for an Operating Rating. (This again is usually taken as 0.75 F_y.)

The TRAP system will apply the standard AASHTO live load vehicles automatically to determine a truss bridge's inventory and operating rating. Additionally, a measure of standard state trucks specified by the user can be built into the system, such that they can be used for a posting rating by merely specifying the vehicle name in the input. Finally, a general truck of any configuration may be input and a posting rating determined. (See Section 3.0, Input.)

In the WSD rating analysis procedure, a Rating Factor for the truss system is formed by the following formula:

$$\text{Rating Factor} = \frac{\text{Allowable Stress} - \text{DL Stress}}{\text{Actual LL} + \text{I Stress}} \qquad (5\text{-}1)$$

This factor dictates the capacity of the bridge to withstand the designated live load. A

rating factor greater than unity indicates that the particular live load considered can safely pass across the bridge without overstressing any structural member.

A factor less than one indicates overstressed members, and may result in a weight limit being specified for the bridge structure.

Since dead load stresses are constant for every member and the allowable stress does not change for each type of rating, this rating factor is the lowest value obtained through the highest possible live load effect for each member.

Computation of dead and live load stresses has been discussed in Sections 5.1 and 5.2. In the process of determining the allowable stress, total stresses are calculated to decide whether the member is in tension or compression. The allowable stresses for inventory, operating, and posting rating are calculated as given below:

(1) Inventory Rating

a. Truss member in tension

$$F_a(IR) = F_{IT} * \min(F_y A_g, F_u A_n U)/A_g \quad (5\text{-}2)$$

b. Truss member in compression

$$C_c = (2\pi^2 E / F_y)^{1/2} \quad (5\text{-}3)$$

When $KL/r < C_c$

$$F_a(IR) = \frac{F_y}{F_{IC}}\left(1 - \frac{\left(\frac{KL}{r}\right)^2 F_y}{4\pi^2 E}\right) \quad (5\text{-}4)$$

When $KL/r > C_c$

$$F_a(IR) = \frac{\pi^2 E}{F_{IC}\left(\frac{KL}{r}\right)^2} \quad (5\text{-}5)$$

Where:

$F_a(IR)$ = the allowable stress for Inventory Rating

F_y = the yield strength of the member

E = the modulus of elasticity

K = the effective length factor

r = the minimum radius of gyration

L = the member length

F_{IT} = the allowable tension stress factor for inventory rating (default = 0.55)

F_{IC} = factor of safety of compression member for inventory rating (default = 2.12; otherwise,
= 2.12 (0.75 - F_{IT}) + 1.7)

(2) Operating Rating

a. Truss member in tension

$$F_a(OR) = F_{OT} * \min(F_y A_g, F_u A_n U)/A_g \quad (5\text{-}6)$$

b. Truss member in compression

$$F_a(OR) = \frac{F_{IC}\, F_a(IR)}{F_{OC}} \quad (5\text{-}7)$$

Where:

$F_a(OR)$= the allowable stress for Operating Rating and

$F_a(IR)$ is calculated by Equation 5-4 or 5-5, depending on the KL/r value

F_{OT} = the allowable tension stress factor for operating rating (default = 0.75)

F_{OC} = factor of safety of compression member for operating rating (default = 1.7; otherwise,
= 2.12 (0.75 - F_{OT}) + 1.7)

(3) Posting Rating (Truck 1,2,3 or a Special Truck)

a. Truss member in tension

$$F_a(\text{Post}) = F_{PT} * \min(F_y A_g, F_u A_n U)/A_g \quad (5\text{-}8)$$

b. Truss member in compression

$$F_a(\text{Post}) = \frac{F_{lc}\, F_a(\text{IR})}{F_{PC}} \quad (5\text{-}9)$$

Where:

F_a (Post) = the allowable stress for Posting Rating, regardless of whether the loading is Truck1,2,3, or a Special Truck

F_{PT} = the allowable tension factor for posting (default = 0.75)

F_{PC} = factor of safety of compression member for posting (default = 1.7; otherwise, = 2.12 (0.75 - F_{PT}) + 1.7)

After the allowable stress is calculated, Equation 5-1 is applied to compute the rating factor which indicates the adequacy of the structure under the applied live load.

5.6 Rating (LFR or LRFR)

For Load Factor Rating (LFR) or Load and Resistance Factor Rating (LRFR), Equation (5-1) is changed to

$$\text{Rating Factor} = \frac{\text{Capacity - DL Force}}{\text{LL + I Force}} \quad (5\text{-}10)$$

where "Capacity" is given in the AASHTO *Manual for Condition Evaluation of Bridges* for

tension and compression members [also as shown in Equations (5-3 through 5-5) without F_{IC} factor]. For LFR, Capacity is F_{cap} and, for LRFR, Capacity is φF_{cap} where φ is the resistance factor (Capacity reduction factor).

"DL Force" is the factored dead load axial force (tension or compression) and expressed as $\gamma_{DL}F_{DL}$ where γ_{DL} is the dead load factor and F_{DL} is the calculated dead load force.
"LL + I Force" is the factored live load plus impact axial forces (tension or compression) and expressed as $\gamma_{LL}F_{LL+I}$ where γ_{LL} is the live load factor and may be varied according to their truck definition (normal load or overload), and F_{LL+I} is the calculated live load force plus the impact effect.

Axial Tension $P_r > \varphi P_n$

where $\left.\begin{matrix} P_n = F_y A_g \\ P_n = F_u A_n U \end{matrix}\right\}$ lesser (LRFD Eq. 6.8.2.1-1&2)

Axial Compression $P_r = \varphi P_n$

where $P_n = 0.66^{\lambda} F_y A_s$ for $\lambda \leq 2.25$

(LRFD Eq. 6.9.4.1-1)

$$P_n = \frac{0.88 F_y A_s}{\lambda} \quad \text{for } \lambda > 2.25 \quad \text{(LRFD Eq. 6.9.4.1-2)}$$

$$\lambda = \left(\frac{K\ell}{r_s \pi}\right)^2 \frac{F_y}{E}$$

Where K = 0.75 for bolted or welded end and =0.875 for pinned ends

TABLE 5.1 DEFINITION OF GROUP LOADINGS COMBINATION – WSD

GROUP	DL	LL + 1	W	WL	LF	T	%
I	1	1					100
IA	1	2					150
II	1		1				125
III	1	1	0.3	1	1		125
IV	1	1				1	125
V	1		1			1	140
VI	1	1	0.3	1	1	1	140

TABLE 5.1a DEFINITION OF GROUP LOADINGS COMBINATION – LRFD

GROUP	DL	LL+1	WS	WL	T_u
Strength I	1.25	1.75			0.5/1.2
Strength II	1.25	1.35			0.5/1.2
Strength III	1.25		1.4		0.5/1.2
Strength IV	1.25				0.5/1.2
Strength V	1.25	1.35	0.4	0.4	0.5/1.2
Service I	1.0	1.0	0.3	0.3	1.0/1.2
Service II	1.0				1.0/1.2

Where:

DL = Dead Load
LL+I = Live Load Plus Impact
WS = Wind Load On Truss
WL = Wind Load On Live Load
LF = Longitudinal Forces
T = Thermal Forces
% = Percentage Of Basic Unit Stress

TABLE 5.2: LOAD RATING CRITERIA

ITEM	LRFD RATING	LFD RATING
LOADS TO BE RATED	HL-93 Type 3 Type 3S2 Type 3-3	HS-20 (or Standard lane Loading)
RESISTANCE FACTOR	As Determined from AASHTO LRFD Bridge Design Specifications Article 6.5.4.2	As Determined from AASHTO Design Specifications
DEAD LOAD FACTOR	1.25	1.3
LIVE LOAD FACTOR	As Determined from the Manual for Bridge Evaluation Table 6A.4.2.2-1 Ranges 1.30 to 1.75	As Determined from AASHTO Maintenance Manual. Inventory Rating: 2.17 Operating Rating: 1.30
IMPACT	As Determined from the manual for Bridge Evaluation Article 6A.4.4.3	As Determined from AASHTO Design Specification Formula 3-1
MULTIPLE LANE LIVE LOAD REDUCTION FACTORS	As Determined from AASHTO LRFD Bridge Design Specifications Table 3.6.1.1.2-1 1 Lane: 1.2 2 Lane: 1.00 3 Lanes: 0.85 4 or More Lanes: 0.65 Lanes Determined by Bridge Striping.	As Determined from AASHTO Maintenance Manual: 1-2 Lanes: 1.00 3 Lanes: 0.90 4 or More Lanes: 0.75 Lanes Determined by Bridge Curb to Curb Width.

6.0 METHODOLOGY OF PRESTRESSED CABLES

Prestressing truss bridges is a means of creating redundancy (i.e., alternate load paths) in the structural system and strengthening it. Consequently, structural strength and reliability can be increased. Since prestressing enlarges the elastic range, increases the fatigue resistance, reduces deflection and increases redundancy, the remaining life of the truss bridge can therefore be increased relatively inexpensively.

The method used in the development of the stiffness matrix of a prestressed plane continuous truss bridge is based on the following three assumptions. The material of the cables is linearly elastic and perfectly plastic, all calculations involving the overall dimension of the truss can be based upon the original dimension of the structure and the axial cable force is constant throughout the length of the cable, i.e., friction between the cables and their paths is zero.

Three cable layouts are considered in this study, a straight cable, a one-drape cable and a two-drape cable. A draped cable can be constructed by passing the cable over a pulley attached to the truss joint, where the cable needs to change its angle, as shown in Figure 3.5. It is assumed that the friction between the pulley and the cable passing over it is negligible, and the cable will be in tension only.

6.1 ANALYSIS OF PRESTRESSED CABLES

The derivation of the cable stiffness matrix is based on the direct stiffness method. Every cable layout is treated as a separate member like any other truss member. The cable force is constant along the cable member, regardless of whether the cable is straight or draped.

A cable layout should not coincide with one truss member. Cable ends should be anchored to truss joints, and in the case of draped cable, where a pulley is used, the pulley should be attached to a truss joint. For more details, refer to Figure 3.6.

The analysis of prestressed cable trusses is divided into two stages. In the first stage, an analysis is performed using the dead load, and prestressing load is applied to the truss without considering the cable stiffness. The second analysis stage considers the live load and the stiffness matrices of the cables. The final solution is achieved by imposing the solutions of the two stages.

A closed form solution for the relationship between the cross-sectional area, the prestressing force of the cable and the desired final member stress after prestressing is derived for a statically determinate truss.

The final truss member stress f_m is given by

$$F_m = \frac{T_D}{A_m} - f_{ci}\frac{A_C}{A_m} + \frac{T_L}{A_m + A_C} \tag{6-1}$$

where T_D is the truss member force due to dead load, A_m is the member area, f_{ci} is the applied prestress stress in the cable, A_c is the cable area and T_L is the truss member force due to live load.

The final cable stress is

$$f_C = f_{ci} + \frac{T_L}{A_m + A_C} = f_t \tag{6-2}$$

where f_t is the allowable cable stress.

Equation 6-2 can be rewritten as

$$f_{ci} = f_t - \frac{T_L}{A_m + A_C} \tag{6-3}$$

Substituting Equation 6-3 in Equation 6-1 and rearranging Equation 6-1 results in

$$(A_C)^2 - \left[\frac{T_D + T_L - f_m A_m}{f_t} - A_m\right]A_C - (T_D + T_L - f_m A_m)\frac{A_m}{f_t} = 0 \tag{6-4}$$

By solving Equation 6-4, the cable cross-sectional area required is

$$A_C = \frac{T_D + T_L - f_m A_m}{f_t} \tag{6-5}$$

Substituting Equation 6-5 in Equation 6-3, the required prestress stress for the cable is

$$f_{ci} = f_t \frac{T_D + A_m (f_t - f_m)}{T_D + T_L + A_m (f_t - f_m)} \tag{6-6}$$

Since the prestress force can be calculated as

$$P_L = f_{ci} * A_c \tag{6-7}$$

then,

$$P_L = (T_D + T_L - f_m A_m)\left[\frac{T_D + A_m (f_t - f_m)}{T_D + T_L + A_m (f_t - f_m)}\right] \tag{6-8}$$

Equations 6-5 and 6-8 still can be used as a guide to start with for statically indeterminate trusses, as a trial and error method is required to reach a solution.

6.2 RATING OF PRESTRESSED CABLES

The TRAP system has the capability to determine the structural rating for the prestressed cables used in prestressing the deficient truss automatically if the rating option is specified in the program. TRAP will rate the cable for inventory, operating, and posting.

$$\text{Cable Rating Factor} = \frac{\text{Allowable Cable Stress} - P_L \text{ Stress}}{\text{Actual Cable LL + I Stress}} \qquad (6\text{-}9)$$

where P_L is the prestressing stress used in pretensioning the cable.

The allowable cable stress for each type of cable rating is calculated by the formula

$$F_a = FI * F_y \qquad (6\text{-}10)$$

where:

F_a = the allowable cable stress
FI = the allowable rating stress factor
F_y = the yield stress for cable

The default allowable rating stress factor for prestressed cable are as follows:

for inventory: 0.6
for operating: 0.9
for posting: 0.9

7.0 SAMPLE PROBLEMS

This document includes three sample problems that can be used as learning tools. Each sample contains a problem description, sketch of the truss, list of input, and partial output. Of the three samples, the third includes a completed input form for a guide to data preparation.

The installation package, distributed with the manual, contains complete input and output of all sample problems. The users may choose to review the input data from the installed directory in order to test the programs that they will install on any PC or PC-compatible.

SAMPLE PROBLEM 1 - 190' SIMPLE TRUSS

EXAMPLE (1) DESCRIPTION

I. Job Title: 1-Span Truss Bridge

II. General Information:

1.	Number of Spans	1
2.	Number of Panel Points	10
3.	Number of Truss Members	34
4.	Span Length	189.72 ft.

III. Loading Conditions:

1. Uniform Loads:

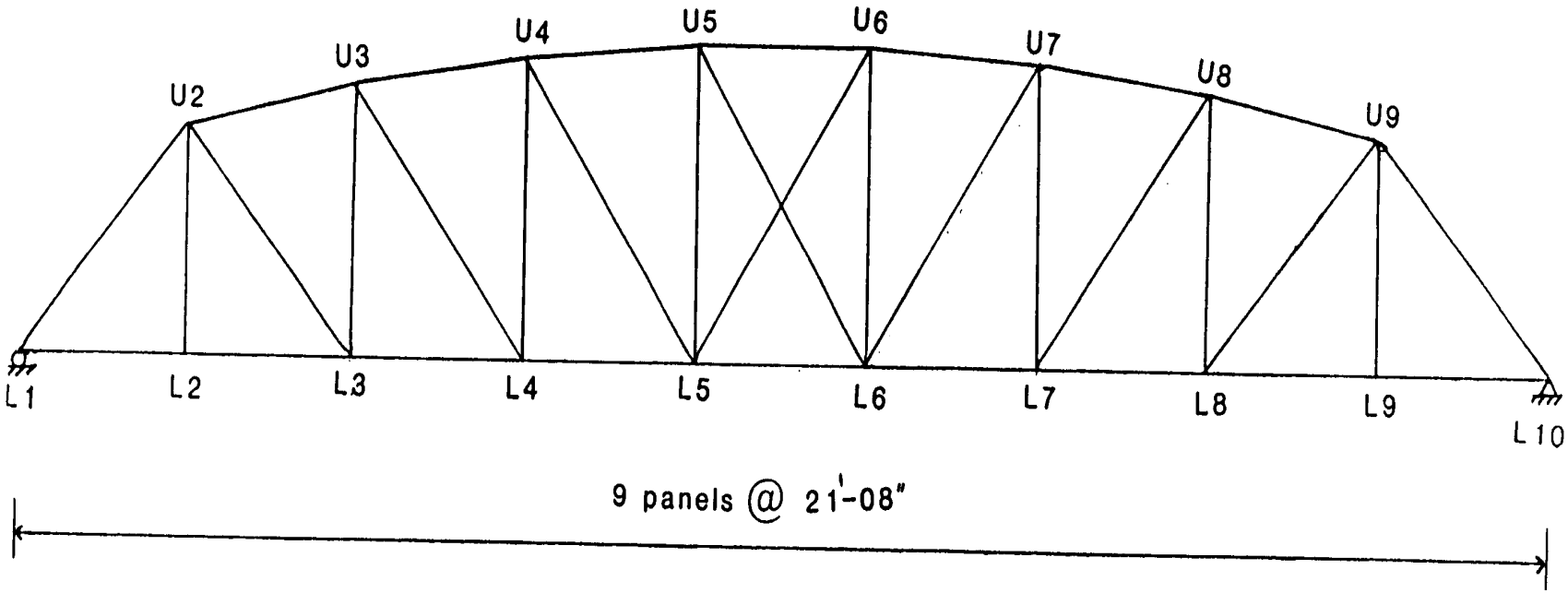
Floor Steel	0.80 K/f
Slab + W. S.	0.53 K/f
Railing and Curb	0.15 K/f

2. Bracing Loads: (See Input Data Card 0702)

3. AASHTO Live Load: HS-15

4. Group Loading: (See Input Data Cards)

- Output in the manual contains Group Loading III for Table 17.3.



Example (1) Truss Layout

INPUT DATA

```
0101 EXAMPLE NO. (1)
0101 STATICAL INDETERMINATE TRUSS
0102 GROUP LOADING ANALYSIS
0103
0103       3         4      29000.          0.075           0
0104
0104 189.72                                                 23.0                 26.25    1.2
0301
0301HS 15 .55 .0 HS 15 .75 .0      0
0401
0401    1    0.0     0.0     1
0401    2  21.08     0.0        21.08  23.0
0401    3  42.16     0.0        42.16  27.5
0401    4  63.24     0.0        63.24  30.5
0401    5  84.32     0.0        84.32  31.5
0401    6 105.40     0.0       105.40  31.5
0401    7 126.48     0.0       126.48  30.5
0401    8 147.56     0.0       147.56  27.5
0401    9 168.64     0.0       168.64  23.0
0401   10 189.72     0.0   1 1
0501
0501    1L  1L  2      1          .469 12.    19.5    16.57 36.    1  1.0 25.0
0501    2L  2L  3                 .469 12.    19.5    16.57 36.    0  1.0 25.0
0501    3L  3L  4                 .721 12.    30.     25.5  36.    0  1.0 25.0
0501    4L  4L  5                 .829 12.    34.5    29.32 36.    0  1.0 25.0
0501    5L  5L  6                 .685 12.    28.5    24.22 36.    0  1.0 25.0
0501    6L  6L  7                 .829 12.    34.5    29.32 36.    0  1.0 25.0
0501    7L  7L  8                 .721 12.    30.     25.5  36.    0  1.0 25.0
0501    8L  8L  9                 .469 12.    19.5    16.57 36.    0  1.0 25.0
0501    9L  9L 10     10          .469 12.    19.5    16.57 36.    0  1.0 25.0
0501   10U  2U  3                3.277 15.    28.67   24.37 36.    1  1.0 20.0
0501   11U  3U  4                3.1   15.    32.35   27.5  36.    0  1.0 20.0
0501   12U  4U  5                2.97  15.    35.25   30.   36.    0  1.0 20.0
0501   13U  5U  6                2.97  15.    35.25   30.   36.    0  1.0 20.0
0501   14U  6U  7                2.97  15.    35.25   30.   36.    0  1.0 20.0
0501   15U  7U  8                3.1   15.    32.35   27.5  36.    0  1.0 20.0
0501   16U  8U  9                3.277 15.    28.67   24.37 36.    0  1.0 20.0
0501   17L  2U  2      2 23.     1.54  12.    10.3     8.75 36.    1  1.0  0.0
0501   18L  3U  3      3 27.5    2.48  12.    15.6    13.26 36.    0  1.0  0.0
0501   19L  4U  4      4 30.5    1.54  12.    10.3     8.75 36.    0  0.5  0.0
0501   20L  5U  5      5 31.5    1.54  12.    10.3     8.75 36.    0  0.5  0.0
0501   21L  6U  6      6 31.5    1.54  12.    10.3     8.75 36.    0  0.5  0.0
0501   22L  7U  7      7 30.5    1.54  12.    10.3     8.75 36.    0  0.5  0.0
0501   23L  8U  8      8 27.5    2.48  12.    15.6    13.26 36.    0  1.0  0.0
0501   24L  9U  9      9 23.     1.54  12.    10.3     8.75 36.    0  1.0  0.0
0501   25L  1U  2                2.97  15.    35.25   30.   36.    1  1.0  0.0
0501   26L  3U  2                1.96  15.    14.7    12.5  36.    0  1.0  0.0
0501   27L  4U  3                1.54  15.    10.3     8.75 36.    0  1.0  0.0
0501   28L  5U  4                1.54  15.    10.3     8.75 36.    0  0.5  0.0
0501   29L  5U  6                1.54  15.    10.3     8.75 36.    0  0.5  0.0
0501   30L  6U  5                1.54  15.    10.3     8.75 36.    0  0.5  0.0
0501   31L  6U  7                1.54  15.    10.3     8.75 36.    0  0.5  0.0
0501   32L  7U  8                1.54  15.    10.3     8.75 36.    0  1.0  0.0
0501   33L  8U  9                1.96  15.    14.7    12.5  36.    0  1.0  0.0
0501   34L 10U  9                2.97  15.    35.25   30.   36.    0  1.0  0.0
0601
0601  1  .8       0.0  189.72
0602
0602  1  .53      0.0  189.72
0603


0603  1  .15      0.0  189.72
0604
0604  1  .1       0.0  189.72
0702
0702 2  2.3 3  2.3 4  2.3 5  2.3 6  2.3 7  2.3 8  2.3 9  2.3
```

OUTPUT RESULTS

CONFORMS TO 1983 AASHTO SPEC. UP TO 1987 INTERIM EXCLUDING LOAD FACTOR DESIGN.

PROGRAM TRAP -

EXAMPLE NO. (1)
STATICAL INDETERMINATE TRUSS

GROUP LOADING ANALYSIS

ALL INFORMATION PRESENTED IS FOR REVIEW,APPROVAL,
INTERPRETATION AND APPLICATION BY A REGISTERED
ENGINEER ONLY

TABLE 1.1 SYSTEM INPUT

PROGRAM OPTIONS

OUTPUT OPTION	SYSTEM OPTION	MOD. OF ELAS. (KSI)	WIND INTS. (KSF)	CABLE OPTION
3	4	29000.00	.07500	0

GENERAL TRUSS CONFIGURATION

SPAN LENGTHS

SPAN 1 (FEET)
189.72

CONFIGURATION DETAILS

DISTFACT OPTION			
CURB DISTANCE (FT)	DIST FACT	DISTANCE BETWEEN TRUSSES (FT)	DEAD LOAD DETAIL FACTOR
23.00	.000	26.250	1.200

TABLE 1.2 GENERAL LIVE LOAD AND RATING DATA

AASHTO LIVE LOAD

INVENTORY RATING DATA			OPERATING RATING DATA			INTERSTATE
AASHTO LOAD NAME	ALLOWABLE STRESS FACTOR MEMBER	CABLE	AASHTO LOAD NAME	ALLOWABLE STRESS FACTOR MEMBER	CABLE	(MILITARY) LOADING 1=Y,0=N
HS-15	.55	.00	HS-15	.75	.00	0

STATE VEHICULAR LOADINGS

VEHICLE 1 NAME	VEHICLE 2 NAME	VEHICLE 3 NAME	ALLOW STRESS FACTOR MEMBER	CABLE
			.00	.00

TABLE 17.3 GROUP LOADING III

MEMBER FORCE IN LOWER CHORDS

MEMBER LCT	W. (KIPS)	W.L. (KIPS)	L.F. (KIPS)	GROUP III= (GP I (+/-)(0.3W,WL,LF))/1.25 MAX. (KIPS)	MIN. (KIPS)
L 1 L 2	20.92	1.77	2.54	184.42	120.34
L 2 L 3	20.92	1.77	2.54	184.42	120.34
L 3 L 4	31.43	2.59	3.72	270.87	176.68
L 4 L 5	37.17	3.00	4.31	314.72	205.18
L 5 L 6	39.77	3.18	4.47	333.36	219.19
L 6 L 7	37.17	3.00	4.31	314.72	205.18
L 7 L 8	31.43	2.59	3.72	270.87	176.68
L 8 L 9	20.92	1.77	2.54	184.42	120.34
L 9 L10	20.92	1.77	2.54	184.42	120.34

TABLE 17.3 GROUP LOADING III

MEMBER FORCE IN UPPER CHORDS

MEMBER	LCT	W. (KIPS)	W.L. (KIPS)	L.F. (KIPS)	GROUP III= (GP I (+/-)(0.3W,WL,LF))/1.25 MAX. (KIPS)	MIN. (KIPS)
U 2 U 3		32.14	2.64	3.80	-180.66	-276.97
U 3 U 4		37.55	3.03	4.36	-207.24	-317.89
U 4 U 5		40.41	3.23	4.65	-221.35	-339.51
U 5 U 6		40.97	3.27	4.60	-223.19	-340.80
U 6 U 7		40.41	3.23	4.65	-221.35	-339.51
U 7 U 8		37.55	3.03	4.36	-207.24	-317.89
U 8 U 9		32.14	2.64	3.80	-180.66	-276.97

TABLE 17.3 GROUP LOADING III

MEMBER FORCE IN VERTICAL MEMBERS

MEMBER	LCT	W. (KIPS)	W.L. (KIPS)	L.F. (KIPS)	GROUP III= (GP I (+/-)(0.3W,WL,LF))/1.25 MAX. (KIPS)	MIN. (KIPS)
L 2 U 2	T	4.64	.48	1.25	-11.96	-61.28
L 2 U 2	B	4.64	.48	1.25	17.55	12.55
L 3 U 3	T	6.08	.41	1.45	18.68	-32.72
L 3 U 3	B	6.08	.41	1.45	-51.47	-92.99
L 4 U 4	T	1.25	.06	1.16	16.85	-8.56
L 4 U 4	B	1.25	.06	1.16	-19.29	-61.63
L 5 U 5	T	1.02	.08	1.14	16.80	-8.51
L 5 U 5	B	1.02	.08	1.14	-13.27	-53.68
L 6 U 6	T	1.02	.08	1.14	16.96	-30.99
L 6 U 6	B	1.02	.08	1.14	-13.27	-53.68
L 7 U 7	T	1.25	.06	1.16	-13.19	-60.05
L 7 U 7	B	1.25	.06	1.16	-19.29	-61.63
L 8 U 8	T	6.08	.41	1.45	68.77	25.43
L 8 U 8	B	6.08	.41	1.45	-51.47	-92.99
L 9 U 9	T	4.64	.48	1.25	2.50	-2.50
L 9 U 9	B	4.64	.48	1.25	17.55	12.55

TABLE 17.3 GROUP LOADING III

MEMBER FORCE IN DIAGONAL MEMBERS

MEMBER LCT	W. (KIPS)	W.L. (KIPS)	L.F. (KIPS)	GROUP III= (GP I (+/-)(0.3W,WL,LF))/1.25 MAX. (KIPS)	MIN. (KIPS)
L 1 U 2	30.96	2.61	4.14	-177.79	-280.34
U 2 L 3	15.56	1.21	2.19	137.10	71.64
U 3 L 4	9.44	.68	1.65	85.99	25.97
U 4 L 5	5.62	.40	1.48	62.61	4.37
L 5 U 6	1.08	.09	.68	19.99	-8.42
U 5 L 6	1.08	.09	.68	19.99	-8.42
L 6 U 7	5.62	.40	1.48	62.61	4.37
L 7 U 8	9.44	.68	1.65	85.99	25.97
L 8 U 9	15.56	1.21	2.19	137.10	71.64
U 9 L10	30.96	2.61	4.14	-177.79	-280.34

SAMPLE PROBLEM 2 - 190' SIMPLE TRUSS WITH PRESTRESSED CABLES

EXAMPLE (2) DESCRIPTION

I Job Title: 1-Span Prestressed Truss Bridge

II General Information:

1.	Number of Spans	1
2.	Number of Panel Points	10
3.	Number of Truss Members	34
4.	Span Length	189.72

III Loading Conditions:

5. Uniform Loads:

Floor Steel	0.80 K/f
Slab + W. S.	0.53 K/f
Railing and Curb	0.15 K/f

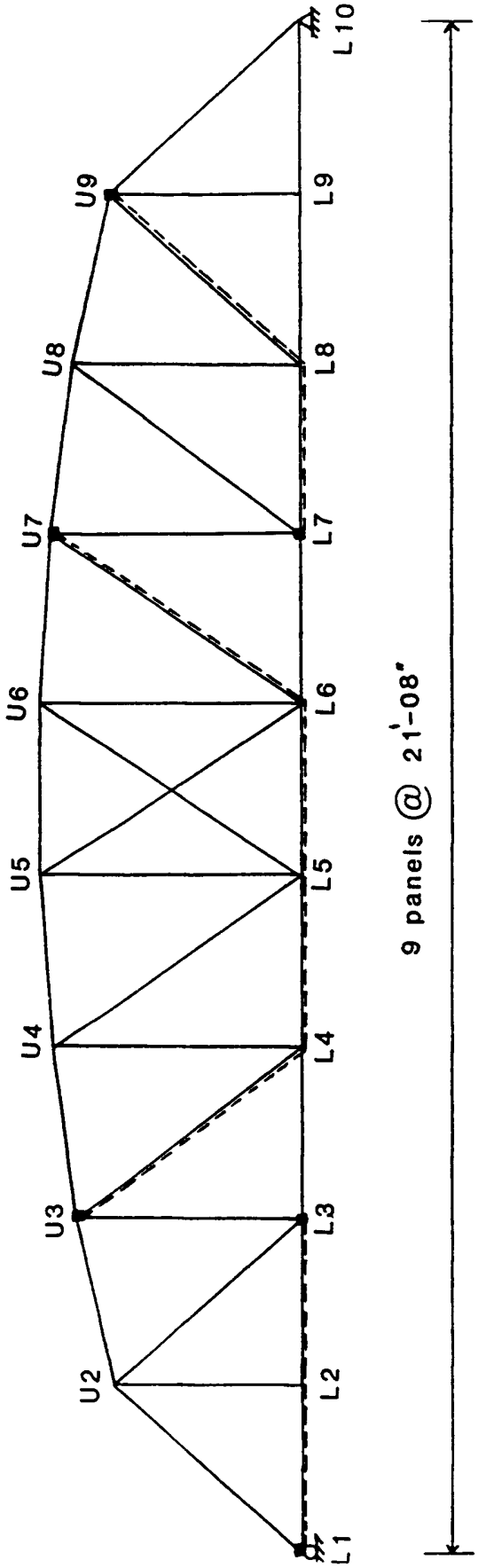
6. Bracing Loads: (see Input Data Card 0702)

7. AASHTO Live Load: HS-15

8. Prestressed Cable Force:

Straight Cable	100 Kips
One Drape Cable	100 Kips
Two Drape Cable	50 Kips

- Output in the manual contains PL + DL + LL + I Force Summary (Table 10)



Example (2) Prestressed Truss Layout

INPUT DATA

```
0101 EXAMPLE NO. (2)
0101 STATICAL INDETERMINATE TRUSS
0102 PRESTRESSED STEEL TRUSS BRIDGE
0103
0103      3        2     29000.        0.             1
0104
0104 189.72                                        23.0              26.25   1.2
0301
0301HS 15 .55 .6 HS 15 .75 .9     0
0401
0401   1   0.0    0.0    1
0401   2  21.08   0.0       21.08  23.0
0401   3  42.16   0.0       42.16  27.5
0401   4  63.24   0.0       63.24  30.5
0401   5  84.32   0.0       84.32  31.5
0401   6 105.40   0.0      105.40  31.5
0401   7 126.48   0.0      126.48  30.5
0401   8 147.56   0.0      147.56  27.5
0401   9 168.64   0.0      168.64  23.0
0401  10 189.72   0.0  1 1
0501
0501   1L  1L  2     1         .469 12.   19.5   16.57 36.   1  1.0  0.0
0501   2L  2L  3               .469 12.   19.5   16.57 36.   0  1.0  0.0
0501   3L  3L  4               .721 12.   30.    25.5  36.   0  1.0  0.0
0501   4L  4L  5               .829 12.   34.5   29.32 36.   0  1.0  0.0
0501   5L  5L  6               .685 12.   28.5   24.22 36.   0  1.0  0.0
0501   6L  6L  7               .829 12.   34.5   29.32 36.   0  1.0  0.0
0501   7L  7L  8               .721 12.   30.    25.5  36.   0  1.0  0.0
0501   8L  8L  9               .469 12.   19.5   16.57 36.   0  1.0  0.0
0501   9L  9L 10    10         .469 12.   19.5   16.57 36.   0  1.0  0.0
0501  10U  2U  3              3.277 15.   28.67  24.37 36.   1  1.0  0.0
0501  11U  3U  4              3.1   15.   32.35  27.5  36.   0  1.0  0.0
0501  12U  4U  5              2.97  15.   35.25  30.   36.   0  1.0  0.0
0501  13U  5U  6              2.97  15.   35.25  30.   36.   0  1.0  0.0
0501  14U  6U  7              2.97  15.   35.25  30.   36.   0  1.0  0.0
0501  15U  7U  8              3.1   15.   32.35  27.5  36.   0  1.0  0.0
0501  16U  8U  9              3.277 15.   28.67  24.37 36.   0  1.0  0.0
0501  17L  2U  2     2 23.    1.54  12.   10.3    8.75 36.   1  1.0  0.0
0501  18L  3U  3     3 27.5   2.48  12.   15.6   13.26 36.   0  1.0  0.0
0501  19L  4U  4     4 30.5   1.54  12.   10.3    8.75 36.   0  0.5  0.0
0501  20L  5U  5     5 31.5   1.54  12.   10.3    8.75 36.   0  0.5  0.0
0501  21L  6U  6     6 31.5   1.54  12.   10.3    8.75 36.   0  0.5  0.0
0501  22L  7U  7     7 30.5   1.54  12.   10.3    8.75 36.   0  0.5  0.0
0501  23L  8U  8     8 27.5   2.48  12.   15.6   13.26 36.   0  1.0  0.0
0501  24L  9U  9     9 23.    1.54  12.   10.3    8.75 36.   0  1.0  0.0
0501  25L  1U  2              2.97  15.   35.25  30.   36.   1  1.0  0.0
0501  26L  3U  2              1.96  15.   14.7   12.5  36.   0  1.0  0.0
0501  27L  4U  3              1.54  15.   10.3    8.75 36.   0  1.0  0.0
0501  28L  5U  4              1.54  15.   10.3    8.75 36.   0  0.5  0.0
0501  29L  5U  6              1.54  15.   10.3    8.75 36.   0  0.5  0.0
0501  30L  6U  5              1.54  15.   10.3    8.75 36.   0  0.5  0.0
0501  31L  6U  7              1.54  15.   10.3    8.75 36.   0  0.5  0.0
0501  32L  7U  8              1.54  15.   10.3    8.75 36.   0  1.0  0.0
0501  33L  8U  9              1.96  15.   14.7   12.5  36.   0  1.0  0.0
0501  34L 10U  9              2.97  15.   35.25  30.   36.   0  1.0  0.0
0502
0502   1  L  1  L  3       0.85     216.0        100.0   1
0503
0503   1  L  7  L  8  U  9        0.85    216.0        100.0   1
```

```
0504
0504      1    U  3   L  4   L  6   U  7        0.85    216.0    50.0    1
0601
0601  1       .8        0.0   189.72
0602
0602  1       .53       0.0   189.72
0603
0603  1       .15       0.0   189.72
0604
0604  1       .1        0.0   189.72
0702
0702  2  2.3 3   2.3 4   2.3 5   2.3 6   2.3 7   2.3 8   2.3 9   2.3
```

OUTPUT RESULTS

TABLE 10.1A PL+DL+LL+I FORCE SUMMARY FOR LOWER CHORD MEMBERS

AASHTO LOADING RESULTS

MEMBER	TOTAL DL + PL (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE PL+DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE PL+DL+LL+I (K)	TYPE
L 1 L 2	61.00	56.48	L	.00		117.48	L	61.00	
L 2 L 3	61.00	56.48	L	.00		117.48	L	61.00	
L 3 L 4	236.59	86.26	L	.00		322.85	L	236.59	
L 4 L 5	224.93	98.01	L	.00		322.94	L	224.93	
L 5 L 6	244.51	101.59	L	.00		346.11	L	244.51	
L 6 L 7	274.93	100.00	L	.00		374.93	L	274.93	
L 7 L 8	136.59	83.90	L	.00		220.49	L	136.59	
L 8 L 9	161.00	58.94	L	.00		219.94	L	161.00	
L 9 L10	161.00	58.94	L	.00		219.94	L	161.00	

TABLE 10.2A PL+DL+LL+I FORCE SUMMARY FOR UPPER CHORD MEMBERS

AASHTO LOADING RESULTS

MEMBER	TOTAL DL + PL (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE PL+DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE PL+DL+LL+I (K)	TYPE
U 2 U 3	-241.92	.00		-88.21	L	-241.92		-330.12	L
U 3 U 4	-277.70	.00		-101.01	L	-277.70		-378.71	L
U 4 U 5	-296.69	.00		-107.70	L	-296.69		-404.39	L
U 5 U 6	-298.19	.00		-106.64	L	-298.19		-404.84	L
U 6 U 7	-296.69	.00		-107.70	L	-296.69		-404.39	L
U 7 U 8	-277.70	.00		-101.01	L	-277.70		-378.71	L
U 8 U 9	-241.92	.00		-88.21	L	-241.92		-330.12	L

TABLE 10.4A PL+DL+LL+I FORCE SUMMARY FOR VERTICAL MEMBERS

AASHTO LOADING RESULTS

MEMBER LCT	TOTAL DL + PL (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE PL+DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE PL+DL+LL+I (K)	TYPE
L 2 U 2 T	35.47	46.81	HS	.00		82.28	HS	35.47	
L 2 U 2 B	18.82	.00		.00		18.82		18.82	
L 3 U 3 T	-45.22	27.14	HS	-28.26	HS	-18.07	HS	-73.47	HS
L 3 U 3 B	-78.53	10.50	HS	-34.03	L	-68.02	HS	-112.55	L
L 4 U 4 T	-12.57	32.24	HS	-24.64	HS	19.67	HS	-37.21	HS
L 4 U 4 B	-45.88	20.17	HS	-29.57	HS	-25.71	HS	-75.45	HS
L 5 U 5 T	4.51	16.45	HS	-12.15	HS	20.96	HS	-7.64	HS
L 5 U 5 B	-28.79	12.15	HS	-35.29	HS	-16.65	HS	-64.09	HS
L 6 U 6 T	4.51	16.42	HS	-12.13	HS	20.94	HS	-7.62	HS
L 6 U 6 B	-28.79	12.11	HS	-35.29	HS	-16.68	HS	-64.08	HS
L 7 U 7 T	-12.57	32.24	HS	-24.64	HS	19.67	HS	-37.21	HS
L 7 U 7 B	-45.88	20.17	HS	-29.57	HS	-25.71	HS	-75.45	HS
L 8 U 8 T	-45.22	27.14	HS	-28.26	HS	-18.07	HS	-73.47	HS
L 8 U 8 B	-78.53	10.50	HS	-34.03	L	-68.02	HS	-112.55	L
L 9 U 9 T	35.47	46.81	HS	.00		82.28	HS	35.47	
L 9 U 9 B	18.82	.00		.00		18.82		18.82	

TABLE 10.5A PL+DL+LL+I FORCE SUMMARY FOR DIAGONAL MEMBERS

AASHTO LOADING RESULTS

MEMBER	TOTAL DL + PL (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE PL+DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE PL+DL+LL+I (K)	TYPE
L 1 U 2	-238.29	.00		-96.09	L	-238.29		-334.38	L
U 2 L 3	111.87	51.44	L	-14.25	HS	163.31	L	97.62	HS
U 3 L 4	13.03	37.08	L	-25.57	HS	50.11	L	-12.54	HS
U 4 L 5	37.68	37.01	HS	-28.65	HS	74.69	HS	9.03	HS
L 5 U 6	3.31	18.79	HS	-14.51	HS	22.09	HS	-11.21	HS
U 5 L 6	3.31	18.81	HS	-14.54	HS	22.12	HS	-11.23	HS
L 6 U 7	-12.32	34.62	HS	-28.84	HS	22.29	HS	-41.17	HS
L 7 U 8	63.03	39.29	L	-25.41	HS	102.32	L	37.62	HS
L 8 U 9	11.87	48.79	L	-14.06	HS	60.66	L	-2.20	HS
U 9 L10	-238.29	.00		-96.09	L	-238.29		-334.38	L

TABLE 10.6A PL+LL+I FORCE SUMMARY FOR STRAIGHT CABLES

AASHTO LOADING RESULTS

CABLE	PRE STRESS LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM CABLE FORCE PL+LL+I (K)	TYPE	MINIMUM CABLE FORCE PL+LL+I (K)	TYPE
L 1 L 3	100.00	2.71	L	.00		102.71	L	100.00	

TABLE 10.6B PL+LL+I FORCE SUMMARY FOR ONE-DRAPE CABLES

AASHTO LOADING RESULTS

CABLE	PRE STRESS LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM CABLE FORCE PL+LL+I (K)	TYPE	MINIMUM CABLE FORCE PL+LL+I (K)	TYPE
L 7 L 8 U 9	100.00	2.68	L	-.18	HS	102.68	L	99.82	HS

TABLE 10.6C PL+LL+I FORCE SUMMARY FOR TWO-DRAPE CABLES

AASHTO LOADING RESULTS

CABLE	PRE STRESS LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM CABLE FORCE PL+LL+I (K)	TYPE	MINIMUM CABLE FORCE PL+LL+I (K)	TYPE
U 3 L 4 L 6 U 7	50.00	2.33	HS	.00		52.33	HS	50.00	

SAMPLE PROBLEM 3 - 3 SPAN CONTINUOUS DECK TRUSS

EXAMPLE (3) DESCRIPTION

I. Job Title: 3-Span Continuous Deck Truss Bridge

II. General Information:

1. Number of Spans 3

2. Number of Panel Points 31

3. Number of Truss Members 121

4. Total Number of Released Members 3

5. Span Length:

Span No. 1 = 210' - 00"

Span No. 2 = 180' - 00"

Span No. 3 = 210' - 00"

III. Loading Conditions:

1. Uniform Load:

Floor Steel	0.95 K/f
Slab + W. S.	0.56 K/f
Railing and Curb	0.48 K/f

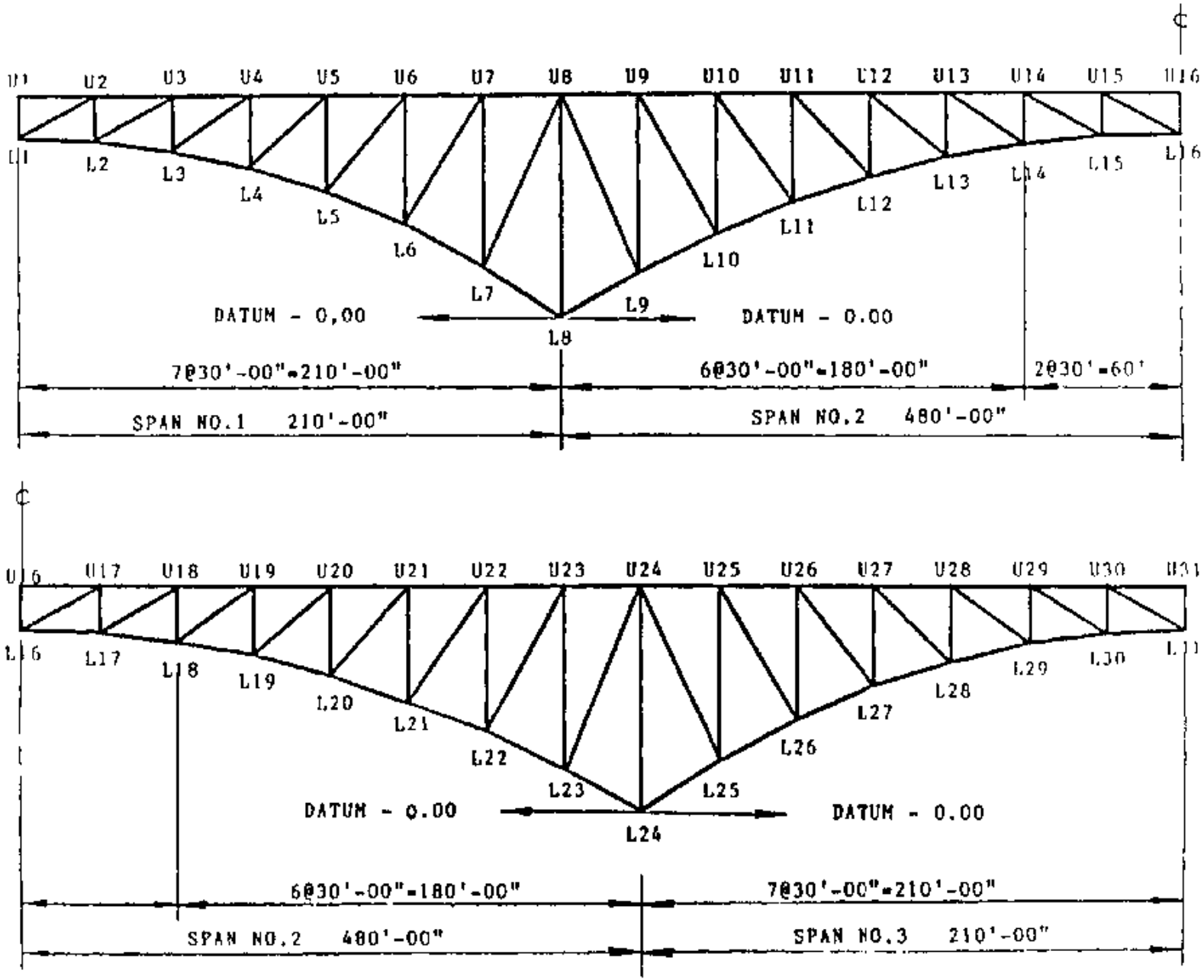
2. Bracing Loads: (see Input Data Card 0701 and 0702)

3. AASHTO Live Load: HS-20

4. State Vehicular Loading: (4S1, 5C3, 6T1)

5. Special Truck Loading: S-20-40

- Output in the manual contains Rating Summary for Table 16.


U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16
L1 L2 L3 L4 L5 L6 L7 L8 L9 L10 L11 L12 L13 L14 L15 L16
DATUM - 0.00
DATUM - 0.00
7@30'-00"=210'-00"
6@30'-00"=180'-00"
2@30'=60'
SPAN NO.1 210'-00"
SPAN NO.2 480'-00"
U16 U17 U18 U19 U20 U21 U22 U23 U24 U25 U26 U27 U28 U29 U30 U31
L16 L17 L18 L19 L20 L21 L22 L23 L24 L25 L26 L27 L28 L29 L30 L31
DATUM - 0.00
DATUM - 0.00
6@30'-00"=180'-00"
7@30'-00"=210'-00"
SPAN NO.2 480'-00"
SPAN NO.3 210'-00"

EXECUTE NAME: TRAP

PROJECT DESCRIPTION

	5 ... 80
0,0,1	SUMMIT NORTH MAIN ST. BRIDGE
0,0,1	PROGRAM TRAP
0,0,2	SPAN DECK CANTILEVER TRUSS

DEFINITION OF PROGRAM OPTIONS

	OUTPUT OPTIONS 11	SYSTEM OPTIONS 20	MODULUS OF ELASTISITY 25 (KSI) 33	WIND INTENSITY (KSF) 38 ... 46	CABLE OPTION 55
0,0,3					
0,0,3	3	2	29000.		

GENERAL TRUSS CONFIGURATION

	SPAN LENGTHS						DIST. FACTOR OPTION ENTER ONE ONLY		DISTANCE BETWEEN TRUSSES (FT.) 65 ... 73	DEAD LOAD DETAIL FACTOR 74 ... 80
	SPAN 1 (FT.) 5 ... 11	SPAN 2 (FT.) 12 ... 18	SPAN 3 (FT.) 19 ... 25	SPAN 4 (FT.) 26 ... 32	SPAN 5 (FT.) 33 ... 39	SPAN 6 (FT.) 40 ... 46	CURB DIST. (FT.) 47 ... 55	DISTRIBUTION FACTOR 56 ... 64		
0,0,4										
0,0,4	210.000	420.000	210.000					2.0250	40.000	1.2000

GENERAL LIVE LOAD AND RATING DATA

	AASHTO LIVE LOAD--H, HS TRUCK INFORMATION					STATE VEHICULAR LOADINGS--POSTING INFORMATION				
	INVENTRY. RATING		OPERATNG. RATING		INTERSTATE				ALLOW. STRESS FACTOR	
	AASHTO LOAD NAME	ALLOWABLE STRESS FACTOR	AASHTO LOAD NAME	ALLOWABLE STRESS FACTOR	LOADING YES=1 NO =0	VEHICLE 1 DESIGNAT.	VEHICLE 2 DESIGNAT.	VEHICLE 3 DESIGNAT.	MEMBER	CAB.
	5 9	10 17	18 22	23 30	35	41 49	50 58	59 67	68 74	75 78
0301										
0301	HS-20		HS-20		1	H S 1	E G 3	G T 1	0.75	

SPECIAL TRUCK LOADING--IDENTIFICATION AND POSTING INFORMATION

	LOADING DESIGNAT.	DESCRIPTION	ALLOW. STRESS FACTOR	
	5 13	14 55	MEMBER 56 61	CABLE 62 67
0302				
0302	S-20-80	DESIGN LOADING S-20-80	0.55	

SPECIAL TRUCK LOADING--AXLE WEIGHTS AND SPACINGS

	AXLE		SPACING		AXLE		SPACING		AXLE		SPACING		AXLE		SPACING	
	NO.	WEIGHT (KIPS)	NO.	DISTANCE (FT.)	NO.	WEIGHT (KIPS)	NO.	DISTANCE (FT.)	NO.	WEIGHT (KIPS)	NO.	DISTANCE (FT.)	NO.	WEIGHT (KIPS)	NO.	DISTANCE (FT.)
	6	7 13	15	16 22	24	25 31	33	34 40	42	43 49	51	52 58	60	61 67	69	70 76
0303																
0303	1	8.000	1	14.000	2	32.000	2	14.000	3	32.000	3		4		4	
0303	5		5		6		6		7		7		8		8	
0303	9		9		10		10		11		11		12		12	
0303	13		13		14		14		15		15		16		16	
0303	17		17		18		18		19		19		20			

STATE VEHICLE 1 IF NOT DEFINED

	AXLE		SPACING		AXLE		SPACING		AXLE		SPACING		AXLE		SPACING	
	NO. 6	WEIGHT (KIPS) 7 13	NO. 15	DISTANCE (FT.) 16 22	NO. 24	WEIGHT (KIPS) 25 31	NO. 33	DISTANCE (FT.) 34 40	NO. 42	WEIGHT (KIPS) 43 49	NO. 51	DISTANCE (FT.) 52 58	NO. 60	WEIGHT (KIPS) 61 67	NO. 69	DISTANCE (FT.) 70 76
0304																
0304	1	10.000	1	15.000	2	16.000	2	4.000	3	16.000	3	4.000	4	16.000	4	

STATE VEHICLE 2 IF NOT DEFINED

	AXLE		SPACING		AXLE		SPACING		AXLE		SPACING		AXLE		SPACING	
	NO. 6	WEIGHT (KIPS) 7 13	NO. 15	DISTANCE (FT.) 16 22	NO. 24	WEIGHT (KIPS) 25 31	NO. 33	DISTANCE (FT.) 34 40	NO. 42	WEIGHT (KIPS) 43 49	NO. 51	DISTANCE (FT.) 52 58	NO. 60	WEIGHT (KIPS) 61 67	NO. 69	DISTANCE (FT.) 70 76
0305																
0305	1	8.000	1	12.000	2	16.000	2	4.000	3	16.000	3	24.000	4	20.000	4	10.000

STATE VEHICLE 3 IF NOT DEFINED

	AXLE		SPACING		AXLE		SPACING		AXLE		SPACING		AXLE		SPACING	
	NO. 6	WEIGHT (KIPS) 7 13	NO. 15	DISTANCE (FT.) 16 22	NO. 24	WEIGHT (KIPS) 25 31	NO. 33	DISTANCE (FT.) 34 40	NO. 42	WEIGHT (KIPS) 43 49	NO. 51	DISTANCE (FT.) 52 58	NO. 60	WEIGHT (KIPS) 61 67	NO. 69	DISTANCE (FT.) 70 76
0306																
0306	1	10.000	1	13.000	2	16.000	2	4.000	3	16.000	3	4.000	4	16.000	4	10.000

PANEL POINT DATA

	PANEL POINT NO. 8	LOWER PANEL POINTS X COORD. (FT.) 9 15	Y COORD. (FT.) 16 22	1 = REST. X 24	1 = REST. Y 26	UPPER PANEL POINTS X COORD. (FT.) 27 33	Y COORD. (FT.) 34 40	1 = REST. X 42	1 = REST. Y 44	PANEL POINTS A X COORD. (FT.) 45 51	Y COORD. (FT.) 52 58	1 = REST. X 60	1 = REST. Y 62	PANEL POINTS B X COORD. (FT.) 63 69	Y COORD. (FT.) 70 76	1 = REST. X 78	1 = REST. Y 80
0401																	
0401	1	0.00	69.00	1	1	0.00	85.00										
0401	2	30.00	67.59			30.00	85.00										
0401	3	60.00	63.37			60.00	85.00										
0401	4	90.00	56.33			90.00	85.00										
0401	5	120.00	46.47			120.00	85.00										
0401	6	150.00	33.80			150.00	85.00										
0401	7	180.00	18.31			180.00	85.00										
0401	8	210.00	0.00	1	1	210.00	85.00										
0401	9	240.00	16.17			240.00	85.00										
0401	10	270.00	30.19			270.00	85.00										
0401	11	300.00	43.05			300.00	85.00										
0401	12	330.00	51.75			330.00	85.00										
0401	13	360.00	59.30			360.00	85.00										
0401	14	390.00	64.67			390.00	85.00										
0401	15	420.00	67.72			420.00	85.00										
0401	16	450.00	67.00			450.00	85.00										
0401	17	480.00	67.92			480.00	85.00										
0401	18	510.00	64.69			510.00	85.00										
0401	19	540.00	59.30			540.00	85.00										
0401	20	570.00	51.75			570.00	85.00										

MEMBER DATA

	MEM. NO. 5 8	SEE NOTE 1 MEMBER LOCATION AND DESIGNA. 9 13 16		1=REL. MEMBER 19	LOADED MEMBERS SEQ NO. 22	LOADED MEMBERS DECK LOCA. (FT.) 23 28	MINIMUM RADIUS OF GYR. (IN.) 29 35	MEM. DEPTH (IN.) 36 40	MEMBER AREAS GROSS (SQ.IN.) 41 47	MEMBER AREAS NET (SQ.IN.) 48 54	YIELD STRESS 58	INFL. LINE OPT. 61	EFFECTIVE LENGTH FACTOR 62 66	TEMPERATURE CHANGE 67 71
0501														
0501	1L	1L	2				11.00	38.00	66.750	65.430	33.			
0501	2L	2L	3				11.00	38.00	105.390	105.390	33.			
0501	3L	3L	4				11.30	38.00	119.630	119.630	33.			
0501	4L	4L	5				11.10	38.00	127.890	127.890	33.			
0501	5L	5L	6				11.00	38.00	135.780	135.780	33.			
0501	6L	6L	7				11.00	38.00	144.000	144.000	33.			
0501	7L	7L	8				11.00	38.00	141.060	141.060	33.			

NOTE 1: MEMBER LOCATION AND DESIGNA. FIELD IS ACTUALLY 4 FIELDS.

COLUMNS 9 AND 13 ARE ALPHA FIELDS. COLUMNS 10 THRU 12 AND 14 THRU 16 ARE NUMERIC FIELDS AND MUST BE RIGHT JUSTIFIED.

DEAD LOAD DATA

	LD. NO.	UNIFORM LOAD (KLF)	DISTANCE FROM LEFT END FROM (FT.)	DISTANCE FROM LEFT END TO (FT.)	LD. NO.	UNIFORM LOAD (KLF)	DIST. FROM LEFT END BRIDGE FROM (FT.)	DIST. FROM LEFT END BRIDGE TO (FT.)	LD. NO.	UNIFORM LOAD (KLF)	DIST. FROM LEFT END BRIDGE FROM (FT.)	DIST. FROM LEFT END BRIDGE TO (FT.)
	7	8 14	15 21	22 28	31	32 38	39 45	46 52	55	56 62	63 69	70 76
				UNIFORM LOADS DUE TO FLOOR STEEL								
0601												
0601	1	0.9500	0.00	999.00	2				3			
0601	4				5				6			
0601	7				8				7			
				UNIFORM LOADS DUE TO SLAB + W.S.								
0602												
0602	1	0.5600	0.00	999.00	2				3			
0602	4				5				6			
0602	7				8				9			
				UNIFORM LOADS DUE TO RAILING + CURB								
0603												
0603	1	0.1850	0.00	999.00	2				3			
0603	4				5				6			
0603	7				8				9			
	-			UNIFORM LOADS DUE TO UTIL. + ACCESS								
0604												
0604	1				2				3			
0604	4				5				6			
0604	7				8				9			

LOADS DUE TO LOWER PANEL POINT BRACING

	P.P. NO.	LOAD KIPS	P.P. NO.	LOAD KIPS	P.P. NO.	LOAD KIPS	P.P. NO.	LOAD KIPS	P.P. NO.	LOAD KIPS	P.P. NO.	LOAD KIPS	P.P. NO.	LOAD KIPS	P.P. NO.	LOAD KIPS	P.P. NO.	LOAD KIPS	P.P. NO.	LOAD KIPS
	6	7 11	13	14 18	20	21 25	27	28 32	34	35 39	41	42 46	48	49 53	55	56 60	62	63 67	69	70 74
0702																				
0702	1	5.4	2	6.7	3	7.1	4	6.3	5	8.8	6	10.4	7	10.8	8	20.0	9	10.8	10	10.4
0702	11	8.9	12	6.3	13	7.4	14	7.0	15	6.7	16	5.2	17	6.7	18	7.0	19	7.4	20	6.3
0702	21	8.9	22	10.4	23	10.8	24	20.0	25	10.8	26	10.4	27	8.8	28	6.3	29	7.1	30	6.7
0702	31	5.4	32		33		34		35		36		37		38		39		40	
0702	41		42		43		44		45		46		47		48		49			

LOADS DUE TO UPPER PANEL POINT BRACING

	P.P. NO.	LOAD KIPS	P.P. NO.	LOAD KIPS	P.P. NO.	LOAD KIPS	P.P. NO.	LOAD KIPS	P.P. NO.	LOAD KIPS	P.P. NO.	LOAD KIPS	P.P. NO.	LOAD KIPS	P.P. NO.	LOAD KIPS	P.P. NO.	LOAD KIPS	P.P. NO.	LOAD KIPS
	6	7 11	13	14 18	20	21 25	27	28 32	34	35 39	41	42 46	48	49 53	55	56 60	62	63 67	69	70 74
0702																				
0702	1	0.7	2	0.0	3	0.8	4	0.0	5	2.6	6	3.9	7	4.2	8	12.1	9	4.2	10	4.0
0702	11	3.5	12	0.0	13	1.1	14	0.8	15	0.0	16	0.7	17	0.0	18	0.8	19	1.1	20	0.0
0702	21	3.5	22	4.0	23	4.2	24	12.1	25	4.2	26	3.9	27	2.8	28	0.0	29	0.9	30	0.0
0702	31	0.7	32		33		34		35		36		37		38		39		40	
0702	41		42		43		44		45		46		47		48		49			

```
0101SUMMIT NORTH MAIN ST. BRIDGE
0101PROGRAM TRAP
0102SPAN DECK CANTILEVER TRUSS
0103
0103       3         2      29000.                          0
0104
0104210.000480.000210.000                                        2.0250    40.000 1.200
0301
0301HS-20          HS-20               1        4S1        5C3        6T1         0.75
0302
0302      TEST                             TEST VEHICLE          0.55
0303
0303 1 12.000 1 13.875 2 16.050 2  4.250 3 16.050
0304
0304 1 10.000 1 15.000 2 16.000 2  4.000 3 16.000 3  4.000 4 16.000
0305
0305 1  8.000 1 12.000 2 16.000 2  4.000 3 16.000 3 21.000 4 20.000 4 10.000
0305 5 20.000
0306
0306 1 10.000 1 13.000 2 16.000 2  4.000 3 16.000 3  4.000 4 16.000 4 10.000
0306 5 11.000 5 16.000 6 11.000
0401
0401    1   0.00  69.00 0 1   0.00  85.00
0401    2  30.00  67.59      30.00  85.00
0401    3  60.00  63.37      60.00  85.00
0401    4  90.00  56.33      90.00  85.00
0401    5 120.00  46.47     120.00  85.00
0401    6 150.00  33.80     150.00  85.00
0401    7 180.00  18.31     180.00  85.00
0401    8 210.00   0.00 1 1 210.00  85.00
0401    9 240.00  16.17     240.00  85.00
0401   10 270.00  30.19     270.00  85.00
0401   11 300.00  42.05     300.00  85.00
0401   12 330.00  51.75     330.00  85.00
0401   13 360.00  59.30     360.00  85.00
0401   14 390.00  64.69     390.00  85.00
0401   15 420.00  67.92     420.00  85.00
0401   16 450.00  69.00     450.00  85.00
0401   17 480.00  67.92     480.00  85.00
0401   18 510.00  64.69     510.00  85.00
0401   19 540.00  59.30     540.00  85.00
0401   20 570.00  51.75     570.00  85.00
0401   21 600.00  42.05     600.00  85.00
0401   22 630.00  30.19     630.00  85.00
0401   23 660.00  16.17     660.00  85.00
0401   24 690.00   0.00 1 1 690.00  85.00
0401   25 720.00  18.31     720.00  85.00
0401   26 750.00  33.80     750.00  85.00
0401   27 780.00  46.47     780.00  85.00
0401   28 810.00  56.33     810.00  85.00
0401   29 840.00  63.37     840.00  85.00
0401   30 870.00  67.59     870.00  85.00
0401   31 900.00  69.00 0 1 900.00  85.00
0501
0501    1L  1L  2              11.0038.00 66.750 65.420 33.    1.
0501    2L  2L  3              11.0038.00105.390105.390 33.    1.
0501    3L  3L  4              11.3038.00119.630119.630 33.    1.
0501    4L  4L  5              11.1038.00127.890127.890 33.    1.
0501    5L  5L  6              11.0038.00135.980135.980 33.   11.
0501    6L  6L  7              11.0038.00144.000144.000 33.    1.
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0501   7L  7L  8                 11.0038.00141.060141.060 33.    1.
0501   8L  8L  9                 11.0038.00144.000144.000 33.    1.
0501   9L  9L 10                 11.1038.00126.980126.980 33.    1.
0501  10L 10L 11                 11.0038.00119.320119.320 33.    1.
0501  11L 11L 12                 11.0038.00100.890100.890 33.    1.
0501  12L 12L 13                 11.0038.00 83.630 83.630 33.    1.
0501  13L 13L 14                 10.9038.00 51.750 42.950 33.    1.
0501  14L 14L 15  1              11.0038.00 51.750 51.750 33.    1.
0501  15L 15L 16                 11.0038.00 51.750 51.750 33.    1.
0501  16L 16L 17                 11.0038.00 51.750 51.750 33.    1.
0501  17L 17L 18  1              11.0038.00 51.750 51.750 33.    1.
0501  18L 18L 19                 10.9038.00 51.750 42.950 33.    1.
0501  19L 19L 20                 11.0038.00 83.630 83.630 33.    1.
0501  20L 20L 21                 11.0038.00100.890100.890 33.    1.
0501  21L 21L 22                 11.0038.00119.320119.320 33.    1.
0501  22L 22L 23                 11.1038.00126.980126.980 33.    1.
0501  23L 23L 24                 11.0038.00144.000144.000 33.    1.
0501  24L 24L 25                 11.0038.00141.060141.060 33.    1.
0501  25L 25L 26                 11.0038.00144.000144.000 33.    1.
0501  26L 26L 27                 11.0038.00135.980135.980 33.    1.
0501  27L 27L 28                 11.1038.00127.890127.890 33.    1.
0501  28L 28L 29                 11.3038.00119.630119.630 33.    1.
0501  29L 29L 30                 11.0038.00105.390105.390 33.    1.
0501  30L 30L 31                 11.0038.00 66.750 65.420 33.    1.
0501  31U  1U  2                 10.7032.00 47.250 47.250 33.    1.
0501  32U  2U  3                 10.7032.00 54.750 54.200 33.    1.
0501  33U  3U  4                 11.0032.00 88.890 88.890 33.    1.
0501  34U  4U  5                 11.0032.00104.660104.660 33.    1.
0501  35U  5U  6                 11.0032.00112.740112.740 33.    1.
0501  36U  6U  7                 11.0032.00120.240120.240 33.   11.
0501  37U  7U  8                 11.0032.00120.240120.240 33.    1.
0501  38U  8U  9                 11.0032.00112.740112.740 33.    1.
0501  39U  9U 10                 11.0032.00100.890100.890 33.    1.
0501  40U 10U 11                 11.0032.00 85.130 85.130 33.    1.
0501  41U 11U 12                 11.0032.00 65.250 65.250 33.    1.
0501  42U 12U 13                 10.7032.00 47.250 46.300 33.    1.
0501  43U 13U 14                 10.7032.00 47.250 47.250 33.    1.
0501  44U 14U 15                 10.7032.00 47.250 42.530 33.    1.
0501  45U 15U 16                 10.7032.00 61.250 60.020 33.    1.
0501  46U 16U 17                 10.7032.00 61.250 60.020 33.    1.
0501  47U 17U 18                 10.7032.00 47.250 42.530 33.    1.
0501  48U 18U 19  1              10.7032.00 47.250 47.250 33.    1.
0501  49U 19U 20                 10.7032.00 47.250 46.300 33.    1.
0501  50U 20U 21                 11.0032.00 65.250 65.250 33.    1.
0501  51U 21U 22                 11.0032.00 85.130 85.130 33.    1.
0501  52U 22U 23                 11.0032.00100.890100.890 33.    1.
0501  53U 23U 24                 11.0032.00112.740112.740 33.    1.
0501  54U 24U 25                 11.0032.00120.240120.240 33.    1.
0501  55U 25U 26                 11.0032.00120.240120.240 33.    1.
0501  56U 26U 27                 11.0032.00112.740112.740 33.    1.
0501  57U 27U 28                 11.0032.00104.660104.660 33.    1.
0501  58U 28U 29                 11.0032.00 88.890 88.890 33.    1.
0501  59U 29U 30                 10.7032.00 54.750 54.200 33.    1.
0501  60U 30U 31                 10.7032.00 47.250 47.250 33.    1.
0501  61L  1U  1     1            1.9025.38 27.940 27.940 33.    1.
0501  62L  2U  2     2            3.0425.38 37.440 37.440 33.    1.
0501  63L  3U  3     3            3.0425.38 37.440 37.440 33.    1.
0501  64L  4U  4     4            3.0425.38 37.440 37.440 33.    1.
0501  65L  5U  5     5            3.4825.38 41.440 41.440 33.    1.
0501  66L  6U  6     6            4.9825.38 45.380 45.380 33.    1.
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0501   67L   7U   7      7          7.2625.38 53.940 53.940 33.   11.
0501   68L   8U   8      8         12.1025.38 79.130 79.130 33.    1.
0501   69L   9U   9      9          7.2625.38 53.940 53.940 33.    1.
0501   70L  10U  10     10          5.0325.38 52.130 52.130 33.    1.
0501   71L  11U  11     11          5.0025.38 47.630 47.630 33.    1.
0501   72L  12U  12     12          4.9825.38 45.380 45.380 33.    1.
0501   73L  13U  13     13          3.4825.38 41.440 41.440 33.    1.
0501   74L  14U  14     14          3.4225.38 39.440 39.440 33.    1.
0501   75L  15U  15     15          2.6025.38 30.940 30.940 33.    1.
0501   76L  16U  16     16          2.1525.38 30.940 30.940 33.    1.
0501   77L  17U  17     17          2.6025.38 30.940 30.940 33.    1.
0501   78L  18U  18     18          3.4225.38 39.440 39.440 33.    1.
0501   79L  19U  19     19          3.4825.38 41.440 41.440 33.    1.
0501   80L  20U  20     20          4.9825.38 45.380 45.380 33.    1.
0501   81L  21U  21     21          5.0025.38 47.630 47.630 33.    1.
0501   82L  22U  22     22          5.0325.38 52.130 52.130 33.    1.
0501   83L  23U  23     23          7.2625.38 53.940 53.940 33.    1.
0501   84L  24U  24     24         12.1025.38 79.130 79.130 33.    1.
0501   85L  25U  25     25          7.2625.38 53.940 53.940 33.    1.
0501   86L  26U  26     26          4.9825.38 45.380 45.380 33.    1.
0501   87L  27U  27     27          3.4825.38 41.440 41.440 33.    1.
0501   88L  28U  28     28          3.0425.38 37.440 37.440 33.    1.
0501   89L  29U  29     29          3.0425.38 37.440 37.440 33.    1.
0501   90L  30U  30     30          3.0425.38 37.440 37.440 33.    1.
0501   91L  31U  31     31          1.9025.38 27.940 27.940 33.    1.
0501   92L   1U   2                 3.7025.38 64.260 62.970 33.    1.
0501   93L   2U   3                 3.4425.38 44.500 44.060 33.    1.
0501   94L   3U   4                 3.2525.38 37.440 36.690 33.    1.
0501   95L   4U   5                 3.2525.38 35.440 34.730 33.    1.
0501   96L   5U   6                 3.6225.38 36.940 36.570 33.    1.
0501   97L   6U   7                 6.1925.38 46.860 44.520 33.    1.
0501   98L   7U   8                 6.7425.38 48.360 46.430 33.    1.
0501   99U   8L   9                 6.7425.38 48.360 46.430 33.   11.
0501  100U   9L  10                 6.1925.38 46.860 44.520 33.    1.
0501  101U  10L  11                 5.6225.38 45.360 43.090 33.    1.
0501  102U  11L  12                 3.6225.38 36.940 36.570 33.    1.
0501  103U  12L  13                 3.4025.38 41.440 41.030 33.    1.
0501  104U  13L  14                 3.3825.38 44.000 43.560 33.    1.
0501  105U  14L  15                 3.4025.38 41.440 41.030 33.    1.
0501  106U  15L  16                 3.2525.38 35.440 34.730 33.    1.
0501  107L  16U  17                 3.2525.38 35.440 34.730 33.    1.
0501  108L  17U  18                 3.4025.38 41.440 41.030 33.    1.
0501  109L  18U  19                 3.3825.38 44.000 43.560 33.    1.
0501  110L  19U  20                 3.4025.38 41.440 41.030 33.    1.
0501  111L  20U  21                 3.6225.38 36.940 36.570 33.    1.
0501  112L  21U  22                 5.6225.38 45.360 43.090 33.    1.
0501  113L  22U  23                 6.1925.38 46.860 44.520 33.    1.
0501  114L  23U  24                 6.7425.38 48.360 46.430 33.    1.
0501  115U  24L  25                 6.7425.38 48.360 46.430 33.    1.
0501  116U  25L  26                 6.1925.38 46.860 44.520 33.    1.
0501  117U  26L  27                 3.6225.38 36.940 36.570 33.    1.
0501  118U  27L  28                 3.2525.38 35.440 34.730 33.    1.
0501  119U  28L  29                 3.2525.38 37.440 36.690 33.    1.
0501  120U  29L  30                 3.4425.38 44.500 44.060 33.    1.
0501  121U  30L  31                 3.7025.38 64.260 62.970 33.    1.
0601
0601   1 0.9500    0.00 900.00
0602
0602   1 0.5600    0.00 900.00
0603
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0603   1 0.4850    0.00 900.00
0701
0701 1   5.4 2   6.7 3   7.1 4   6.3 5   8.8 6  10.4 7  10.8 8  20.0 9  10.810  10.4
070111   8.912   6.313   7.414   7.015   6.716   6.217   6.718   7.019   7.420   6.3
070121   8.922  10.423  10.524  20.025  10.826  10.427   8.828   6.329   7.130   6.7
070131   5.4
0702
0702 1   0.7 2   0.0 3   0.8 4   0.0 5   2.4 6   3.9 7   4.2 8  12.1 9   4.210   4.0
070211   2.512   0.013   1.114   0.815   0.016   0.717   0.018   0.819   1.120   0.0
070221   2.522   4.023   4.224  12.125   4.226   3.927   2.428   0.029   0.830   0.0
070231   0.7
```

APPENDIX A — INDEX OF OUTPUT TABLES

Table A.1 – Index of Output Tables				
NO.	TABLE TITLE	OUTPUT LEVEL		
		1	2	3
1.0	**INPUT VERIFICATION**			
1.1	System Input	X	X	X
1.2	General Live Load and Rating Data	X	X	X
1.3	Special Live Load Data	X	X	X
1.4	State Vehicular Data	X	X	X
1.5	Panel Point Data	X	X	X
1.6	Member Data	X	X	X
1.6.1*	Straight Cable Data	X	X	X
1.6.2*	One-Drape Cable Data	X	X	X
1.6.3*	Two-Drape Cable Data	X	X	X
1.7	Uniform Dead Load Data	X	X	X
1.8	Bracing Dead Load Data	X	X	X
1.9	Miscellaneous Load Data	X	X	X
2.0	**TRUSS GEOMETRY DEFINITION**			
2.1	Truss Heights		X	X
2.2	Geometric Data for Lower Chord Members		X	X
2.3	Geometric Data for Upper Chord Members		X	X
2.4	Geometric Data for Additional Members		X	X
2.5	Geometric Data for Vertical Members		X	X
2.6	Geometric Data for Diagonal Members		X	X
* These tables are generated for the Cable Option only				

Table A.1 – Index of Output Tables				
NO.	TABLE TITLE	OUTPUT LEVEL 1	2	3
3.0	**TRUSS DEAD LOAD**			
3.1	Dead Loads at Lower Panel Points	X	X	X
3.1A*	Total Dead Load and Prestress Load at Lower Panel Points	X	X	X
3.2	Dead Loads at Upper Panel Points	X	X	X
3.2A*	Total Dead Load and Prestress Load at Upper Panel Point	X	X	X
3.3	Dead Load at Additional Point A	X	X	X
3.3A*	Total Dead Load and Prestress Load at Additional Point A	X	X	X
3.4	Dead Load at Additional Point B	X	X	X
3.4A*	Total Dead Load and Prestress Load at Additional Point B	X	X	X
3.5	Dead Load Deflections Lower Panel Point Deflections	X	X	X
3.5A*	Dead Load and Prestress Deflections Lower Panel Point Deflections	X	X	X
3.6	Dead Load Deflections Upper Panel Point Deflections	X	X	X
3.6A*	Dead Load and Prestress Deflections Upper Panel Point Deflections	X	X	X
3.7	Dead Load Deflections at Additional Point A	X	X	X
3.7A*	Dead Load and Prestress Deflections at Additional Point A	X	X	X
3.8	Dead Load Deflections at Additional Point B	X	X	X
3.8A*	Dead Load and Prestress Deflections at Additional Point B	X	X	X
3.9	Dead Load Forces and Adjusted Lengths in Lower Chords	X	X	X
3.9A*	DL + PL Forces and Adjusted Lengths in Lower Chords	X	X	X
* These tables are generated for the Cable Option only				

Table A.1 – Index of Output Tables				
		OUTPUT LEVEL		
NO.	TABLE TITLE	1	2	3
3.10	DL Forces and Adjusted Lengths in Upper Chords	X	X	X
3.10A*	DL+PL Forces and Adjusted Lengths in Upper Chords	X	X	X
3.11	DL Forces and Adjusted Lengths in Additional Members	X	X	X
3.11A*	DL+PL Forces and Adjusted Lengths in Addtl. Members	X	X	X
3.12	DL Forces and Adjusted Lengths in Vertical Members	X	X	X
3.12A*	DL+PL Forces and Adjusted Lengths in Vertical Members	X	X	X
3.13	DL Forces and Adjusted Lengths in Diagonal Members	X	X	X
3.13A*	DL+PL Forces and Adjusted Lengths in Diag. Members	X	X	X
3.14	Dead Load Reactions	X	X	X
3.14A*	Dead and Prestressing Loads Reaction	X	X	X
3.15	Total Truss Steel Weight	X	X	X
4.0	**OUTPUT LANE FACTOR**			
4.1**	Member Influence Line Values			
4.1A**	Cable Influence Line Values			
4.2	Reaction Influence Line Values			X
5.0	**LIVE LOAD (AASHTO LOADING)**			
5.1	Maximum Live Load Force in Lower Chords			
5.2	Maximum Live Load Force in Upper Chords			
5.3	Maximum Live Load Force in Additional Members			
5.4	Maximum Live Load Force in Vertical Members			
5.5	Maximum Live Load Force in Diagonal Members			
5.6A*	Maximum Live Load Force in Straight Cables		X	X
5.6B*	Maximum Live Load Force in One-Drape Cables		X	X
5.6C*	Maximum Live Load Force in Two-Drape Cables		X	X
5.7	Maximum Live Load Reactions	X	X	X
5.8	Vertical Deflections (LL+I)	X	X	X
* These tables are generated for the Cable Option only				

Table A.1 – Index of Output Tables				
		OUTPUT LEVEL		
NO.	TABLE TITLE	1	2	3
6.0	**LIVE LOAD (TRUCK 1)**			
6.1	Maximum Live Load Force in Lower Chords		X	X
6.2	Maximum Live Load Force in Upper Chords		X	X
6.3	Maximum LL Force in Additional Members		X	X
6.4	Maximum Live Load Force in Vertical Members		X	X
6.5	Maximum Live Load Force in Diagonal Members		X	X
6.6A*	Maximum Live Load Force in Straight Cables		X	X
6.6B*	Maximum Live Load Force in One-Drape Cables		X	X
6.6C*	Maximum Live Load Force in Two-Drape Cables		X	X
6.7	Maximum Live Load Reactions	X	X	X
6.8	Vertical Deflections (LL+I)	X	X	X
7.0	**LIVE LOAD (TRUCK 2)**			
7.1	Maximum Live Load Force in Lower Chords		X	X
7.2	Maximum Live Load Force in Upper Chords		X	X
7.3	Maximum Live Load Force in Additional Members		X	X
7.4	Maximum Live Load Force in Vertical Members		X	X
7.5	Maximum Live Load Force in Diagonal Members		X	X
7.6A*	Maximum Live Load Force in Straight Cables		X	X
7.6B*	Maximum Live Load Force in One-Drape Cables		X	X
7.6C*	Maximum Live Load Force in Two-Drape Cables		X	X
7.7	Maximum Live Load Reactions	X	X	X
7.8	Vertical Deflections (LL+I)	X	X	X
* These tables are generated for the Cable Option only				

Table A.1 – Index of Output Tables				
		OUTPUT LEVEL		
NO.	TABLE TITLE	1	2	3
8.0	**LIVE LOAD (TRUCK 3)**			
8.1	Maximum Live Load Force in Lower Chords		X	X
8.2	Maximum Live Load Force in Upper Chords		X	X
8.3	Maximum Live Load Force in Additional Members		X	X
8.4	Maximum Live Load Force in Vertical Members		X	X
8.5	Maximum Live Load Force in Diagonal Members		X	X
8.6A*	Maximum Live Load Force in Straight Cables		X	X
8.6B*	Maximum Live Load Force in One-Drape Cables		X	X
8.6C*	Maximum Live Load Force in Two-Drape Cables		X	X
8.7	Maximum Live Load Reactions	X	X	X
8.8	Vertical Deflections (LL+I)	X	X	X
9.0	**LIVE LOAD (TRUCK 4)**			
9.1	Maximum Live Load Force in Lower Chords		X	X
9.2	Maximum Live Load Force in Upper Chords		X	X
9.3	Maximum Live Load Force in Additional Members		X	X
9.4	Maximum Live Load Force in Vertical Members		X	X
9.5	Maximum Live Load Force in Diagonal Members		X	X
9.6A*	Maximum Live Load Force in Straight Cables		X	X
9.6B*	Maximum Live Load Force in One-Drape Cables		X	X
9.6C*	Maximum Live Load Force in Two-Drape Cables		X	X
9.7	Maximum Live Load Reactions	X	X	X
9.8	Vertical Deflections (LL+I)	X	X	X
* These tables are generated for the Cable Option only				

Table A.1 – Index of Output Tables				
NO.	TABLE TITLE	OUTPUT LEVEL		
		1	2	3
10.0	**LIVE LOAD (DL+LL+I) AASHTO LOADING**			
10.1	DL+LL+I Force Summary for Lower Chord Members	X	X	X
10.1A*	PL+DL+LL+I Force Summary for Lower Chord Members	X	X	X
10.2	DL+LL+I Force Summary for Upper Chord Members	X	X	X
10.2A*	PL+DL+LL+I Force Summary for Upper Chord Members	X	X	X
10.3	DL+LL+I Force Summary for Additional Members	X	X	X
10.3A*	PL+DL+LL+I Force Summary for Additional Members	X	X	X
10.4	DL+LL+I Force Summary for Vertical Members	X	X	X
10.4A*	PL+DL+LL+I Force Summary for Vertical Members	X	X	X
10.5	DL+LL+I Force Summary for Diagonal Members	X	X	X
10.5A*	PL+DL+LL+I Force Summary for Diagonal Members	X	X	X
10.6A*	PL+LL+I Force Summary for Straight Cables	X	X	X
10.6B*	PL+LL+I Force Summary for One-Drape Cables	X	X	X
10.6C*	PL+LL+I Force Summary for Two-Drape Cables	X	X	X
11.0	**LIVE LOAD (DL+LL+I) – (TRUCK 1)**			
11.1	DL+LL+I Force Summary for Lower Chord Members	X	X	X
11.1A*	PL+DL+LL+I Force Summary for Lower Chord Members	X	X	X
11.2	DL+LL+I Force Summary for Upper Chord Members	X	X	X
11.2A*	PL+DL+LL+I Force Summary for Upper Chord Members	X	X	X
11.3	DL+LL+I Force Summary for Additional Members	X	X	X
11.3A*	PL+DL+LL+I Force Summary for Additional Members	X	X	X
11.4	DL+LL+I Force Summary for Vertical Members	X	X	X
11.4A*	PL+DL+LL+I Force Summary for Vertical Members	X	X	X
11.5	DL+LL+I Force Summary for Diagonal Members	X	X	X
11.5A*	PL+DL+LL+I Force Summary for Diagonal Members	X	X	X
11.6A*	PL+LL+I Force Summary for Straight Cables	X	X	X
11.6B*	PL+LL+I Force Summary for One-Drape Cables	X	X	X
11.6C*	PL+LL+I Force Summary for Two-Drape Cables	X	X	X
* These tables are generated for the Cable Option only				

Table A.1 – Index of Output Tables				
NO.	TABLE TITLE	OUTPUT LEVEL 1	2	3
12.0	**LIVE LOAD (DL+LL+I) — (TRUCK 2)**			
12.1	DL+LL+I Force Summary for Lower Chord Members	X	X	X
12.1A*	PL+DL+LL+I Force Summary for Lower Chord Members	X	X	X
12.2	DL+LL+I Force Summary for Upper Chord Members	X	X	X
12.2A*	PL+DL+LL+I Force Summary for Upper Chord Members	X	X	X
12.3	DL+LL+I Force Summary for Additional Members	X	X	X
12.3A*	PL+DL+LL+I Force Summary for Additional Members	X	X	X
12.4	DL+LL+I Force Summary for Vertical Members	X	X	X
12.4A*	PL+DL+LL+I Force Summary for Vertical Members	X	X	X
12.5	DL+LL+I Force Summary for Diagonal Members	X	X	X
12.5A*	PL+DL+LL+I Force Summary for Diagonal Members	X	X	X
12.6A*	PL+LL+I Force Summary for Straight Cables	X	X	X
12.6B*	PL+LL+I Force Summary for One-Drape Cables	X	X	X
12.6C*	PL+LL+I Force Summary for Two-Drape Cables	X	X	X
* These tables are generated for the Cable Option only				

Table A.1 – Index of Output Tables				
		OUTPUT LEVEL		
NO.	TABLE TITLE	1	2	3
13.0	**LIVE LOAD (DL+LL+I) – (TRUCK 3)**			
13.1	DL+LL+I Force Summary for Lower Chord Members	X	X	X
13.1A*	PL+DL+LL+I Force Summary for Lower Chord Members	X	X	X
13.2	DL+LL+I Force Summary for Upper Chord Members	X	X	X
13.2A*	PL+DL+LL+I Force Summary for Upper Chord Members	X	X	X
13.3	DL+LL+I Force Summary for Additional Members	X	X	X
13.3A*	PL+DL+LL+I Force Summary for Additional Members	X	X	X
13.4	DL+LL+I Force Summary for Vertical Members	X	X	X
13.4A*	PL+DL+LL+I Force Summary for Vertical Members	X	X	X
13.5	DL+LL+I Force Summary for Diagonal Members	X	X	X
13.5A*	PL+DL+LL+I Force Summary for Diagonal Members	X	X	X
13.6A*	PL+LL+I Force Summary for Straight Cables	X	X	X
13.6B*	PL+LL+I Force Summary for One-Drape Cables	X	X	X
13.6C*	PL+LL+I Force Summary for Two-Drape Cables	X	X	X
14.0	**LIVE LOAD (DL+LL+I) – (TRUCK 4)**			
14.1	DL+LL+I Force Summary for Lower Chord Members	X	X	X
14.1A*	PL+DL+LL+I Force Summary for Lower Chord Members	X	X	X
14.2	DL+LL+I Force Summary for Upper Chord Members	X	X	X
14.2A*	PL+DL+LL+I Force Summary for Upper Chord Members	X	X	X
14.3	DL+LL+I Force Summary for Additional Members	X	X	X
14.3A*	PL+DL+LL+I Force Summary for Additional Members	X	X	X
14.4	DL+LL+I Force Summary for Vertical Members	X	X	X
14.4A*	PL+DL+LL+I Force Summary for Vertical Members	X	X	X
14.5	DL+LL+I Force Summary for Diagonal Members			
14.5A*	PL+DL+LL+I Force Summary for Diagonal Members			
14.6A*	PL+LL+I Force Summary for Straight Cables			
14.6B*	PL+LL+I Force Summary for One-Drape Cables			
14.6C*	PL+LL+I Force Summary for Two-Drape Cables			
* These tables are generated for the Cable Option only				

Table A.1 – Index of Output Tables				
NO.	TABLE TITLE	OUTPUT LEVEL 1	2	3
15.0	**ALLOWABLE FORCE**			
15.1	Allowable Force Summary for Lower Chord Members	X	X	X
15.2	Allowable Force Summary for Upper Chord Members	X	X	X
15.3	Allowable Force Summary for Additional Members	X	X	X
15.4	Allowable Force Summary for Vertical Members	X	X	X
15.5	Allowable Force Summary for Diagonal Members	X	X	X
16.0	**TRUSS RATING SUMMARY (DL+LL+I)**			
16.1	DL+LL+I Rating Summary for Lower Chord Members	X	X	X
16.2	DL+LL+I Rating Summary for Upper Chord Members	X	X	X
16.3	DL+LL+I Rating Summary for Additional Members	X	X	X
16.4	DL+LL+I Rating Summary for Vertical Members	X	X	X
16.5	DL+LL+I Rating Summary for Diagonal Members	X	X	X
16.6A*	PL+LL+I Rating Summary for Straight Cables	X	X	X
16.6B*	PL+LL+I Rating Summary for One-Drape Cables	X	X	X
16.6C*	PL+LL+I Rating Summary for Two-Drape Cables	X	X	X
16.7	Summary of Inventory and Operating Rating	X	X	X
16.8	Summary of Posting Vehicle Rating	X	X	X
* These tables are generated for the Cable Option only				

Table A.1 – Index of Output Tables				
NO.	TABLE TITLE	OUTPUT LEVEL		
		1	2	3
17.0	**COMBINATION OF LOADS**			
17.1	Group Loading IA (for WSD/LFD, or Strength II for LRFD)	X	X	X
17.2	Group Loading II (for WSD/LFD, or Strength III for LRFD)	X	X	X
17.3	Group Loading III (for WSD/LFD, or Strength V for LRFD)	X	X	X
17.4	Group Loading IV (for WSD/LFD, or Strength VI for LRFD)	X	X	X
17.5	Group Loading V (for WSD/LFD, or Service I for LRFD)	X	X	X
17.6	Group Loading VI (for WSD/LFD, or Service II for LRFD)	X	X	X
18.0	**SUMMARY OF CRITICAL COMBINATION OF LOADS**			
18.1	Critical Loading for Lower Chords	X	X	X
18.2	Critical Loading for Upper Chords	X	X	X
18.3	Critical Loading for Additional Members	X	X	X
18.4	Critical Loading for Vertical Members	X	X	X
18.5	Critical Loading for Diagonal Members	X	X	X
* These tables are generated for the Cable Option only				